NetOptimization for Large-Scale Integration
of Solar and Wind Power via Storage and Software

NO-GIZMOS
Project Report

Appendix II: Resident & participant perspectives in NO-GIZMOS

Introduction

The most central question within the NO-GIZMOS project is technical in nature and focuses on investigating the effects of (specific ways of) controlling and using home batteries (in the low-voltage grid) on the congestion of the medium-voltage grid. The use of home batteries has a measurable and relevant effect on the medium-voltage grid and can be part of the solution to congestion problems on the medium-voltage grid. In other words, using and controlling home batteries can increase capacity in parts of the electricity network, without the immediate need for costly and time-consuming investments in new cables and distribution stations.

Home batteries can be one of several options for reducing or solving the current capacity problems of the electricity grid. However, for this to be a viable option, households and residents must be willing to purchase a home battery and, if possible, control it (by themselves or others) in a manner that optimizes their effect on grid congestion. In short, this technical solution will only work if residents accept and embrace it.

Using home batteries to reduce grid congestion problems is a social issue as well as a technical one. This report elaborates on the social aspect of the NO-GIZMOS project, focusing on identifying residents' motives and barriers regarding purchasing, owning, and controlling home batteries.

Method

It was known in advance that the number of home batteries available for deployment would be constrained by the allocated budget. Consequently, nine home batteries were installed, with eight of these being situated in households within Ansen, and the ninth installed in the community centre. This meant that the research questions had to be investigated using the eight households and batteries. This number is small, which means that any effects will almost certainly not be robust enough to lead to significance in statistical tests.

This study includes not only households with home battery installations, but also the other residents of Ansen. This makes it possible to better substantiate the generalization of the results from the eight households. Additionally, it presents an opportunity to explore the impact of the installation and utilization of various home batteries on the entire village.

This report will present seven different sub-studies to answer the research question:

1. A village-wide questionnaire, prior to selecting project participants;
2. A village-wide questionnaire, at the end of the project;
3. A series of interviews with randomly selected households, prior to selecting project participants;
4. Interviews with the eight participating households, shortly after the batteries were installed but before the various research scenarios had been started;
5. Interviews with the eight participating households at the end of the project;
6. Experiences from a number of meetings with participants (and sometimes other residents), particularly from a meeting in which possible future scenarios were discussed;
7. A study on changing daily energy consumption patterns to enhance the effectiveness of home batteries.

Furthermore, observations and results from mid-project meetings with participants will provide additional context.

3. Results: surveys

3.1 Outline of Ansen

Statistics Netherlands (CBS) distinguishes between two districts in Ansen: the village itself and the surrounding area. This study covers both districts, some addresses on the outskirts of the outlying area may be excluded because the boundary cannot be drawn unambiguously. For the remainder of this report, Ansen or the village refers to both districts together. The key figures discussed for Ansen are taken from *allecijfers.nl*, which are indirectly from the CBS, and relate to the year 2025.

There is a total of 160 homes, 140 households and 340 residents in Ansen. Of these homes, 114 are owner-occupied (71%), 33 are privately rented (21%), and 13 are social housing homes (8%). Of all homes, 148 are occupied (92%). Some of the privately rented homes -at least eight, but probably more- are vacation homes. In addition, there are several homes where part of the property is rented out by the owners as a vacation home, who therefore live in another part of the same home. It is estimated that there are 140 homes (and 140 households) that could be included in the study, of which 100 are owner-occupied and 40 are rental properties. The average value of immovable property (WOZ-waarde) of the homes is approximately €500,000, which is more than €100,000 above the average for the Netherlands as a whole.

Compared to the rest of the Netherlands, Ansen has a higher percentage of older residents, as shown in Figure 1.

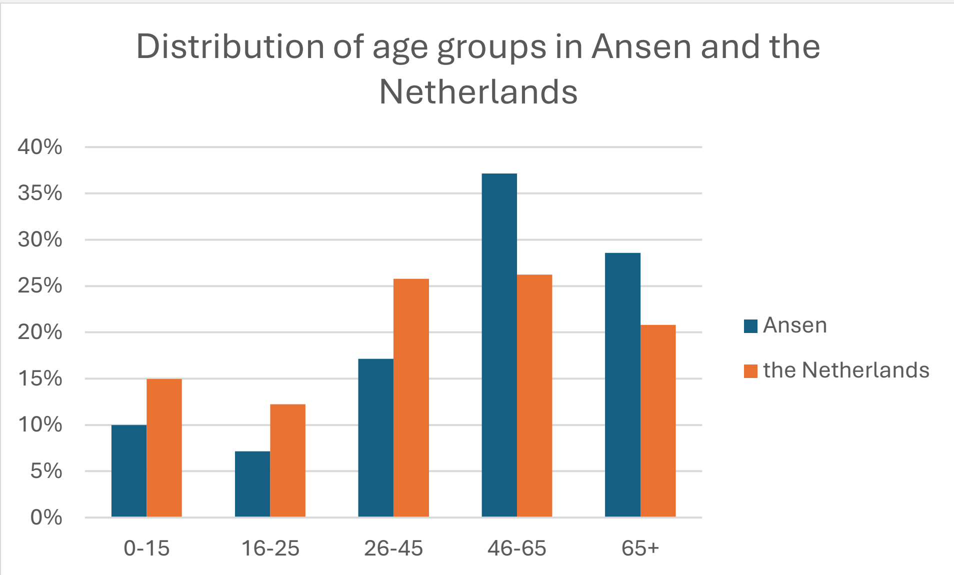


Figure 1: the distribution of residents by age group for Ansen and the Netherlands in 2025. (Source: allecijfers.nl)

Compared to the Netherlands as a whole, the level of education in Ansen is more theoretical and less practical (Figure 2).

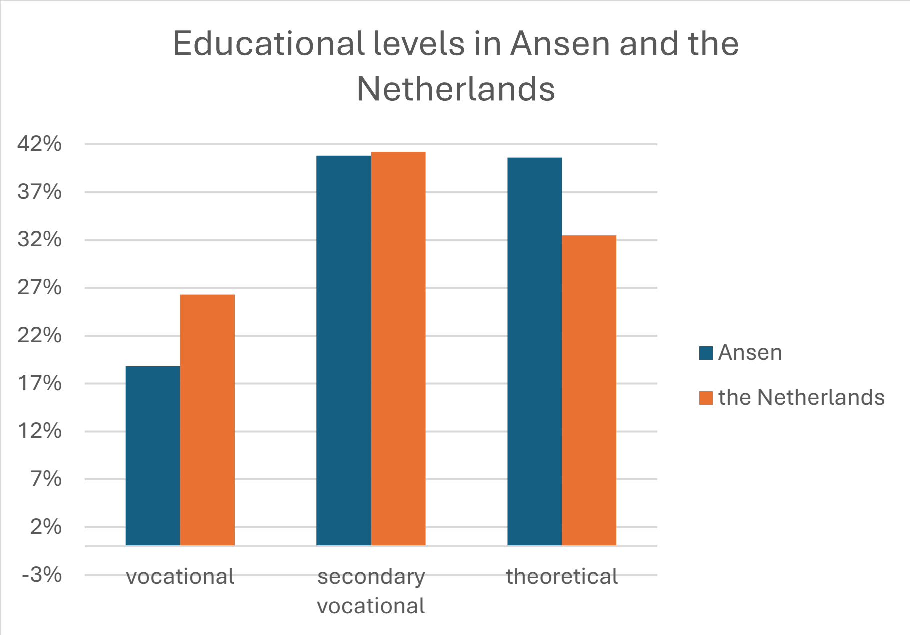


Figure 2: Distribution of residents by educational level for Ansen and the Netherlands in 2025. (Source: allecijfers.nl)

The average income in Ansen is €36,800 per year, slightly lower than the average income for the Netherlands (approximately €42,000). A breakdown into different categories is not available, which would be desirable, because the average is very dependent on outliers and is relatively more strongly influenced by the larger group of pensioners who have a relatively low income.

3.2 Representativeness of the studies

A number of studies have been conducted to gain insight into the residents of Ansen with regard to aspects relevant to the subject of NO-GIZMOS. In this context, it is desirable to be able to assess the extent to which the residents who participated in these studies are representative of the village. This involves three different studies: a questionnaire distributed throughout the village in early 2024, a questionnaire distributed throughout the village in late 2025, and a (small) number of interviews conducted in early 2024.

Regarding the age of the respondents, it should be noted that all studies only recruited adult respondents who live independently in their own household, alone or with a partner. Children or young people living with an adult were not eligible to participate in the studies. As a result, by definition, there can be no respondents in the age category up to 15 years of age, and some of the residents in the 16 to 25 age category were also unable to participate. Taking this into account, it can be concluded from the data in Figure 3 that the age of the respondents is reasonably in line with the age distribution in the entire village, although the 46 to 65 age group is slightly overrepresented.

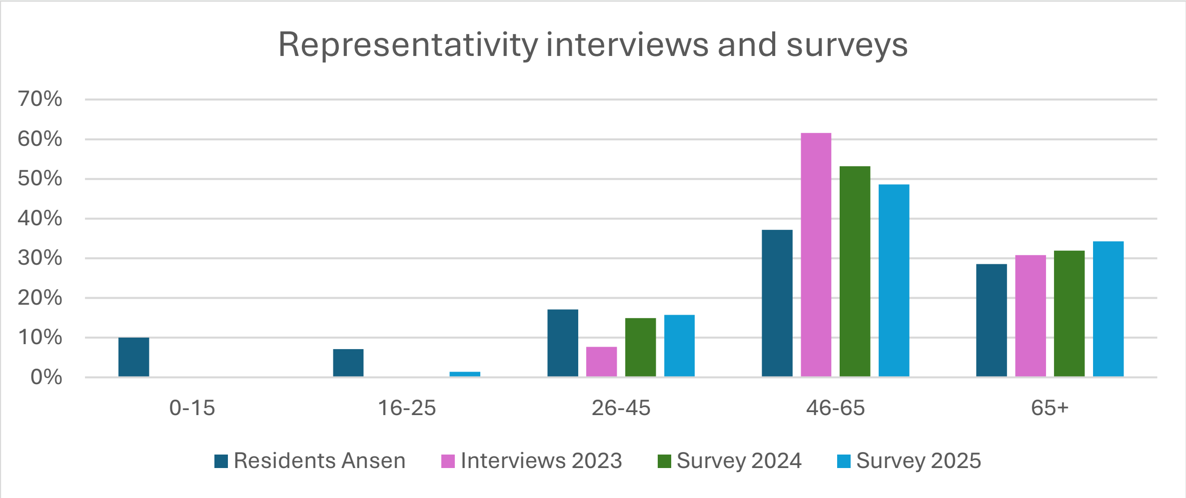


Figure 3: Distribution of respondents across age categories for the village-wide questionnaires, interviews and distribution across the entire village to estimate the representativeness of the respondents.

Regarding the distribution across the various educational categories (Figure 4), it is notable that the group with a vocational education is underrepresented in the 2024 and 2025 questionnaires. Several respondents (seven in the 2024 questionnaire and five in the 2025 questionnaire) did not specify their educational background. However, in terms of educational background, the interviewed group is a reasonably representative sample of the village.

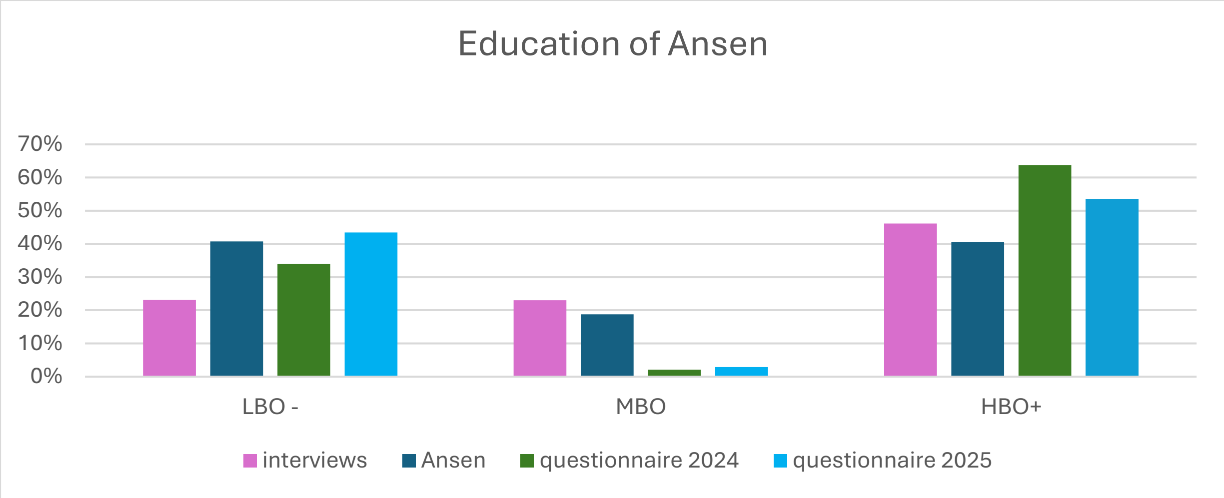


Figure 4: Distribution of respondents across educational categories in the village-wide questionnaires, interviews and the distribution across the entire village for the purpose of assessing the representativeness of the respondents.

Although no data is available on the residents of Ansen broken down by income category, the distribution of incomes was nevertheless examined, as shown in Figure 5.

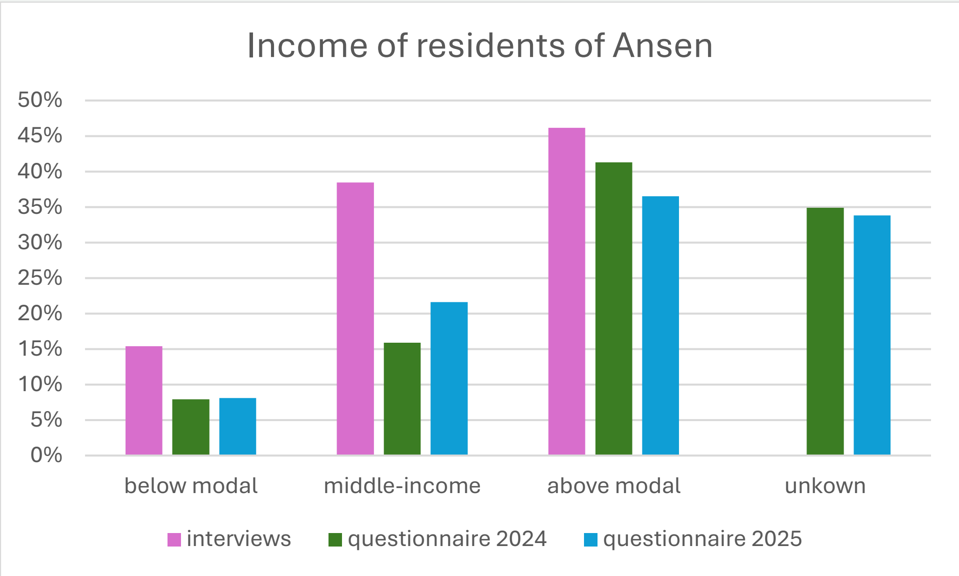


Figure 5: Distribution of respondents across income categories in the three village-wide questionnaires.

Figure 5 shows that a substantial proportion of respondents did not report their income in the questionnaires. Those respondents who did report their income have a relatively high income, but both low and middle income groups are adequately present in the studies. Although the number of low income households is relatively low in the studies, this can be concluded to be not very different from the income distribution within the village, judging from income-related variables like education and home ownership.

Figure 6 shows whether respondents in the various questionnaires are homeowners or renters, with the same data also presented for the entire village of Ansen. A small proportion did not indicate in the questionnaires whether they are renters or owners of their homes. Figure 6 shows that the category of homeowners (owner-occupied homes) is slightly overrepresented in both questionnaire studies. The category of social renters is representative in the 2025 survey, it is especially the private renters that are underrepresented in both surveys.

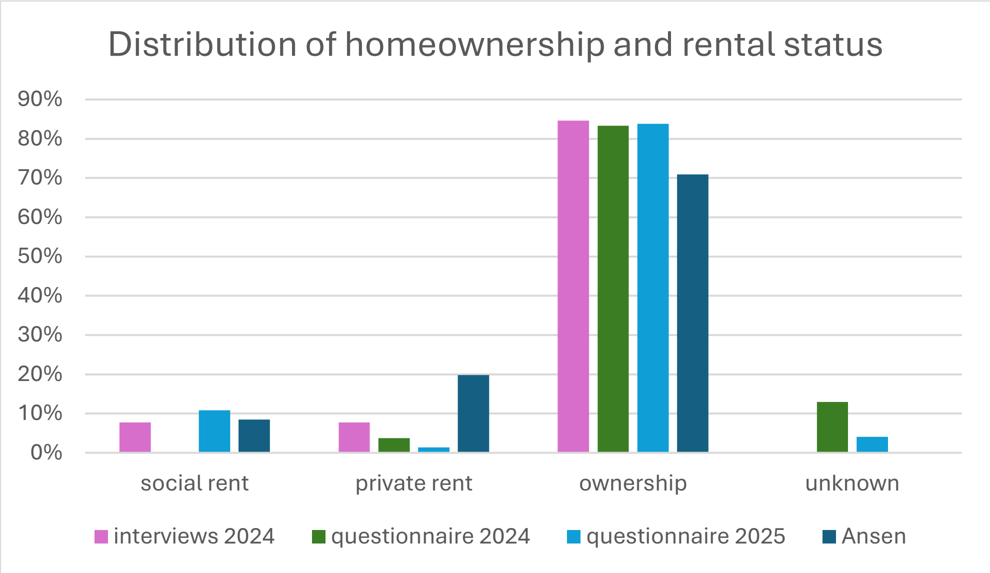


Figure 6: Distribution of respondents by homeownership and rental status across the three village-wide questionnaires, and the distribution across the entire village for the purpose of assessing the representativeness of the respondents.

A possible problem with the representativeness of studies on innovative techniques is that especially people that have a high internal drive for embracing (technological) innovation are prone to participate (the innovators and early adopters according to the theory of diffusion of innovation, Rogers (1995)), while others (the early and late majority and the laggards) are not. The surveys also included questions aimed at categorizing the respondents according to the diffusion of innovation theory, the results of which are depicted in figure 6. As can be seen, the participants belong to the early adopters, the early majority and the late majority and are not only the ones that have a high drive for innovation.

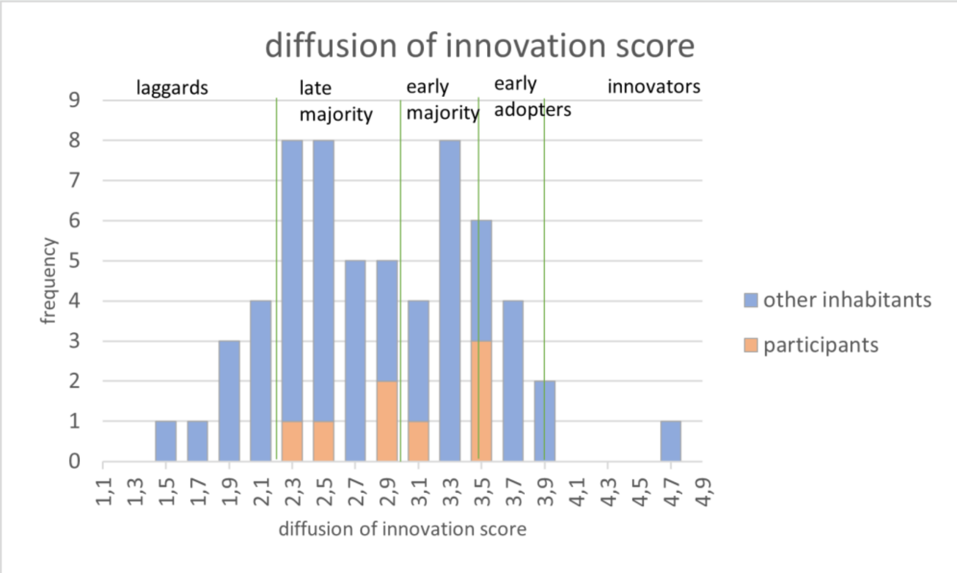
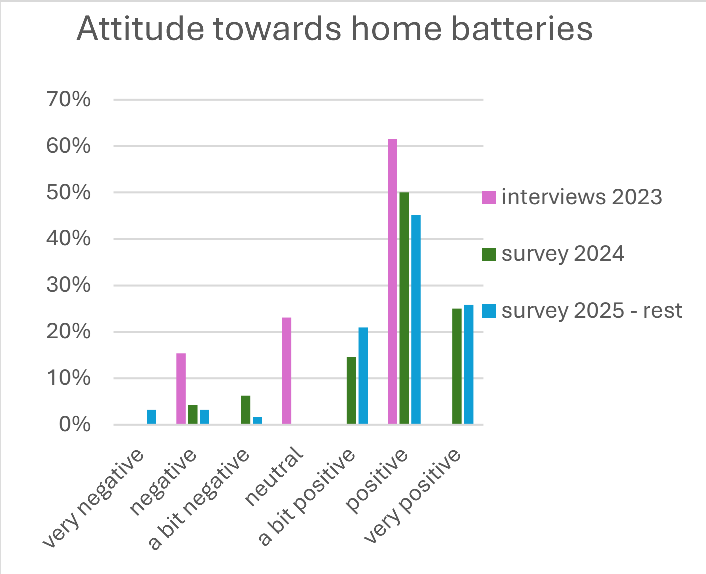


Figure 6: The categorization of respondents within the categories of the diffusion of innovation theory, from the 2025 survey.

Overall, based on the data for which the dataset is complete, it can be concluded that the respondents constitute a representative sample of the village. Among the sections where data is missing, because respondents did not wish to provide the information, the group of respondents appears to include a relatively higher proportion of higher-income individuals and homeowners.

3.3 Attitudes toward home batteries and sustainability

Naturally, the participants in NO-GIZMOS: the households that have installed a battery in their homes, have a positive attitude toward home batteries. In this regard, they are no exception within the village of Ansen, as shown in Figure 7.



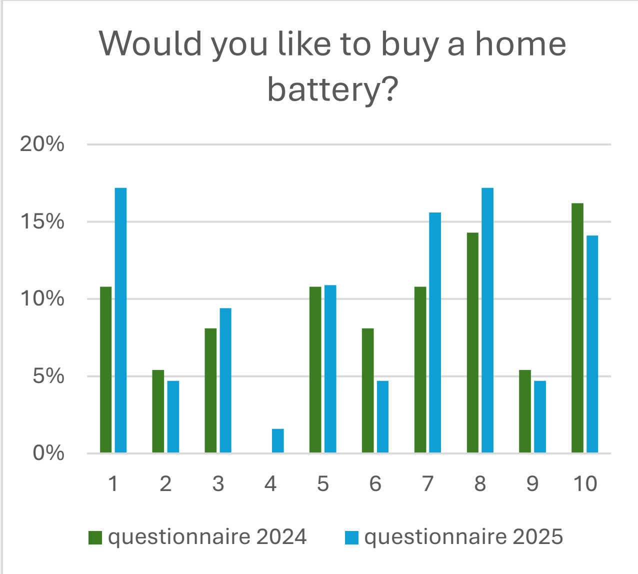


Figure 7: Residents' attitudes toward home batteries as measured in the village-wide questionnaires and interviews. Left: how residents feel about home batteries. Right: whether residents would like to purchase a home battery (1 = "definitely not", 10 = "absolutely yes")

Figure 7 shows that the attitude of Ansen residents toward home batteries is predominantly positive. Only a few (15% in the interviews; 10% in the 2024 questionnaire; 7% in the 2025 questionnaire) indicate that they are very negative to somewhat negative toward home batteries. The rest, which is the vast majority, are positive (with over 20% still neutral in the interviews), to even very positive.

When asked how eager, on a scale of 1 to 10, residents would be to purchase a home battery, that positive attitude is still evident, though somewhat tempered (some are positive about home batteries but do not have a strong desire to purchase one themselves, for example because they lack the financial means). Nevertheless, the majority is quite positive about the desire to purchase a battery; the median in both questionnaire studies is 7 (on a scale of 10, where 1 means someone does not want to buy a battery and 10 means someone does). The average score is slightly lower in the 2015 survey data, but this is not a significant difference (t=0.893; p=0.187).

This positive attitude toward home batteries is consistent with a positive attitude toward the energy transition in a more general sense, as shown in Figure 8.

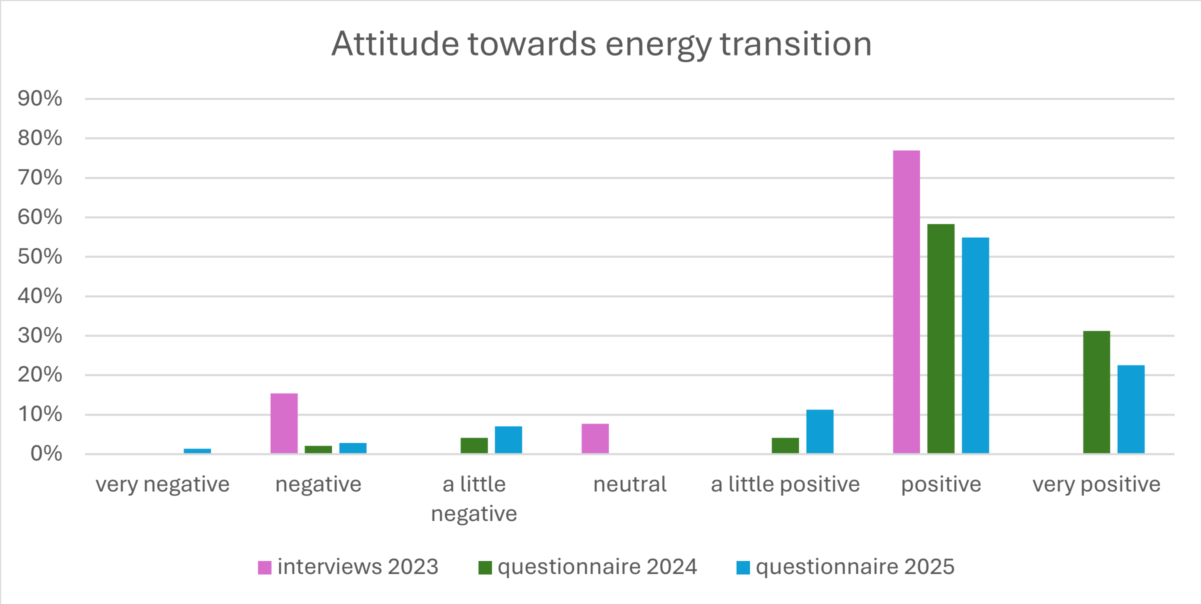


Figure 8: Attitudes toward the energy transition, as measured in the village-wide questionnaires.

In short, the residents of Ansen are generally positive about sustainability and, more specifically, about purchasing a battery.

3.4 Values

The questionnaires measured how important four categories of values were to residents: biospheric values (focused on nature and the environment), altruistic values (focused on community and other people), egoistic values (focused on costs and benefits of choices that influence the resources people have, such as wealth, power, and achievement), and hedonistic values (focused on comfort and pleasure). In the first questionnaire survey in 2024, questions measuring hedonistic values were omitted to keep the survey short. These questions were included in the 2025 survey. As shown in Figure 9, residents are, on average, least strongly oriented toward self-centered, egoistic values. Resources and influence are generally not matters with which they strongly identify. Scores on the values between NO-GIZMOS participants and the rest of the residents do not differ (2025 questionnaire; at the time of the 2024 questionnaire, the participants had not yet been selected).

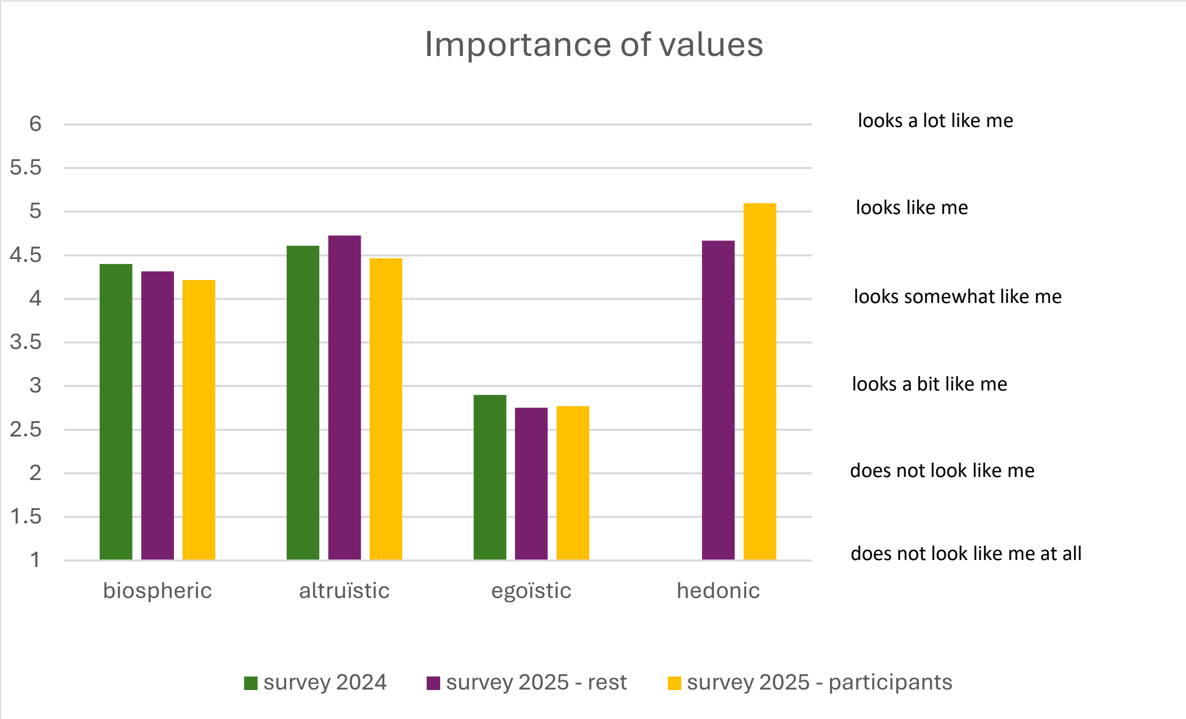


Figure 9: The importance of four categories of values, as measured in the two questionnaire surveys. Note: The 2024 questionnaire did not include questions asking respondents to rate the importance of hedonistic values.

3.5 Factors influencing the decision to purchase a battery

When asked what important considerations influence the decision to purchase a home battery (see Figure 10), the environmental impact of a home battery plays only aa average role.

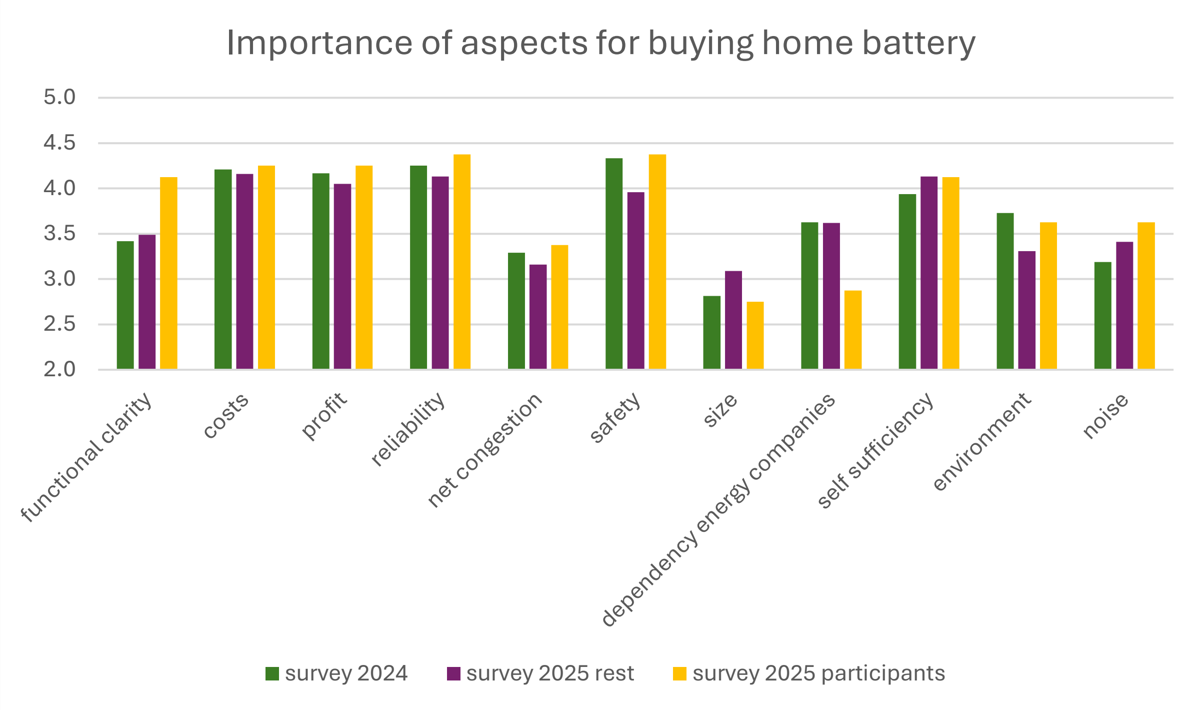


Figure 10: Degree to which considerations are deemed important for the potential purchase of a home battery, as measured in the two questionnaire studies. The "participants" group refers to the 2025 questionnaire and residents with a NO-GIZMOS battery.

There is a clear correlation between the extent to which residents consider biospheric values important and the extent to which they consider environmental considerations important when purchasing a battery (2025 questionnaire, ANOVA, $F(1,63)=55.498$; $p<0.001$): the more residents value biospheric values, the more important they also consider environmental impacts to be in their choice of a battery. A similar effect is also present for altruistic values (2025 questionnaire, ANOVA $F(1,64)=25.588$; $p<0.001$), though much smaller ($R^2=0.289$ vs. 0.472). There are no correlations between egoistic and hedonistic values and the importance of a battery's environmental impacts.

The highest scores are given to, and thus the greatest importance is attached to, purchase cost, return on investment, reliability, safety, and the extent to which a battery enhances self-sufficiency. The space a battery occupies is considered the least important, which is not surprising given the spacious and often detached houses with large barns. Additionally, the effect of a battery on (reducing) grid congestion is seen as less important, similarly as the noise a battery makes.

Although the scores of the NO-GIZMOS participants and the other residents are not exactly the same (this applies only to the 2025 questionnaire, as no participants had been recruited at the time of the 2024 questionnaire), these differences are not significant.

Originally the idea was that the participants were required to fill in a short survey shortly after the deployment of a use case was finished and they had received a report about the results of that use case. The participants filled in the survey after use case 1, but several of them were very late in filling it in after use case 2 (2 did not fill it in at all) so the relationship with the use case itself and the report on its results, was weakened. Therefore the results of that survey are considered incomplete and unvalid. After use case 3 again the participants were somewhat reluctant to fill in the survey (but did it when they were personally contacted to do so). Because of the reluctance to fill in the surveys, they were no longer sent after the use case 3 survey.

All in all, there are results on two of these short surveys in which respondents were asked to what extent they expect a home battery to have an impact on four aspects and how important these aspects were for them: saving on energy bills, increasing self-consumption of self-generated solar power, reducing CO_2 emissions, and alleviating grid congestion. For these four aspects, the difference between what respondents expect the battery to achieve and the importance they attach to that aspect is shown in Figure 11. Only for the aspect of financial return is the difference score negative, meaning that the importance is considered greater than the expected result; for the other aspects, the difference score is positive. Although the scores were obtained from different questions with different response options (but using a comparable 5-point scale) and therefore cannot be directly subtracted from one another, this difference score does provide an indication of the appropriateness of the importance attached to factors and the expectation of whether that importance is also served by a battery. Only with regard to financial return do respondents expect that this is not fully served by the purchase of a battery. The relationship between the importance of financial return compared to the expected return and the intention to purchase a battery is significant (ANOVA $F(1,60)=5.217$; $p<0.05$). The greater the difference between the importance of financial return and the actual expected return, the greater the effect on the intention to purchase a battery: if the difference score is negative, people tend not to purchase a battery; if the difference score is positive, people tend to purchase a battery. For the other factors in Figure 11, there is no significant relationship with the intention to purchase a battery.

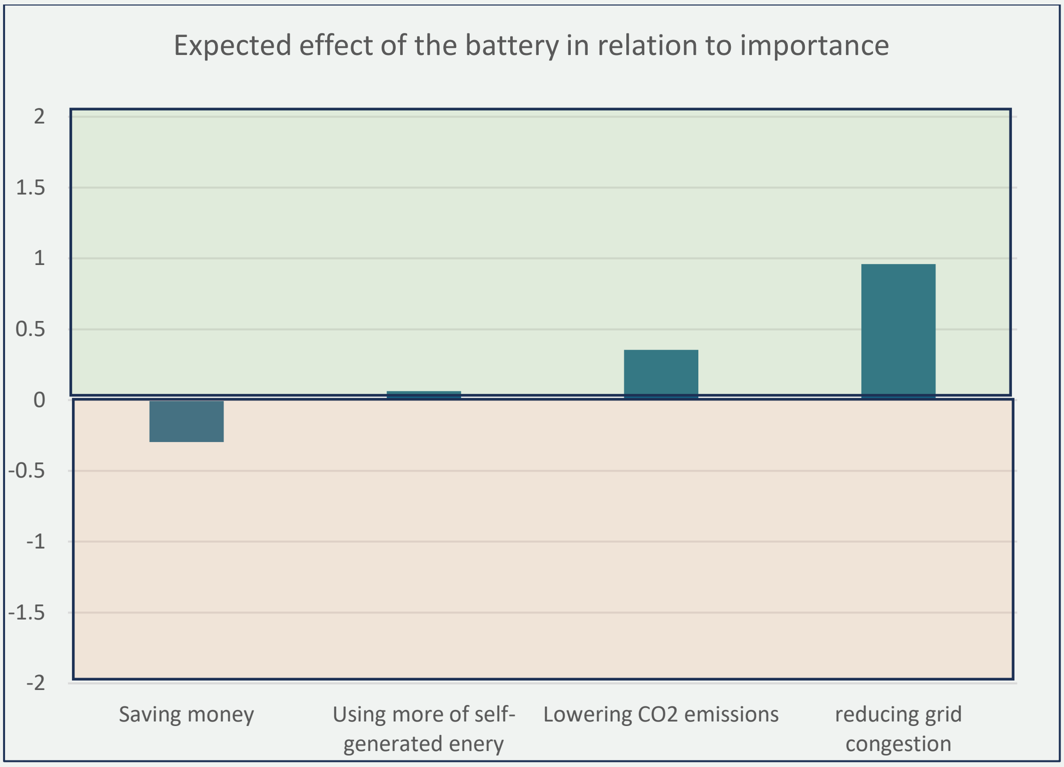


Figure 11: Difference scores between the expected effects of four aspects and the importance attached to those aspects when purchasing a battery. A negative number indicates that the importance is greater than the expected effect; a positive number indicates the opposite.

3.6 Impact/effect of knowledge

The extend to which respondents were knowledgeable about home batteries was also measured with the surveys. In figure 12 is shown that as respondents have more knowledge about home batteries, they are more likely to buy one. The effect is statistically significant for the 2025 survey only (ANOVA $F(1,63)=10{,}154; p<0{,}01$). The knowledge effect is important since the participants indicated (in the interviews and during the participant meetings) that they gained a lot of knowledge regarding home batteries during the project.

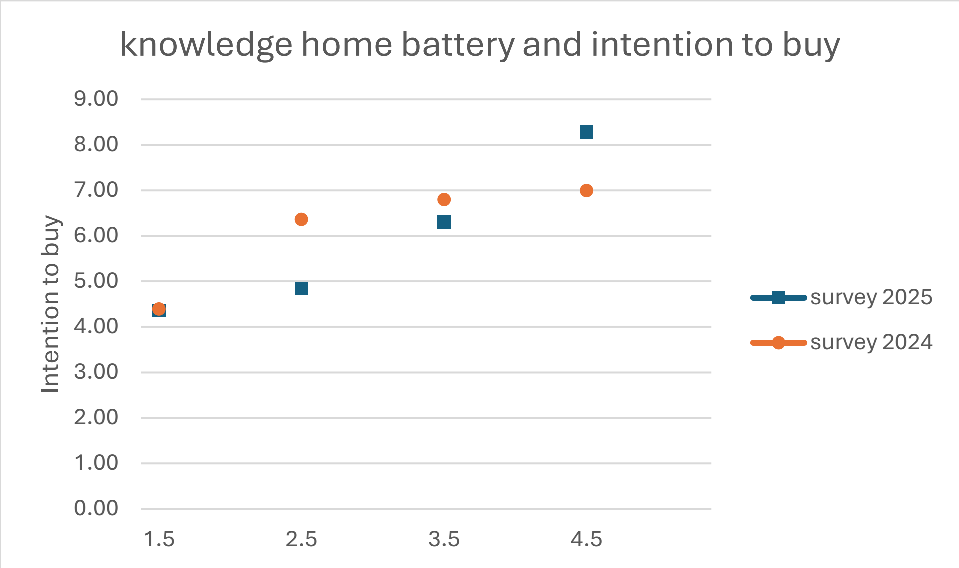


Figure 12: the relation between knowledge of home batteries and the intention to purchase one

3.7 Factors influencing the intention to use a battery

The questionnaires measured the various components of the "technical acceptance model" (Tamilmani, Rada & Nwivedi, 2021), which influence the acceptance of new technologies. This results in a final 'technical acceptance' score for each respondent. This score is the average of four underlying dimensions: perceived usefulness, perceived ease of use, social influence, and facilitating conditions. According to the model, the extent to which a new technology is accepted depends on these underlying dimensions. The acceptance of a new technology, in turn, determines the intention to use that technology (in this case, to purchase a battery).

Figure 13 plots the intention to purchase a battery (which respondents indicated with a whole number between 1 and 10) against the average values for "technical acceptance," including the average values for the underlying, constituent dimensions.

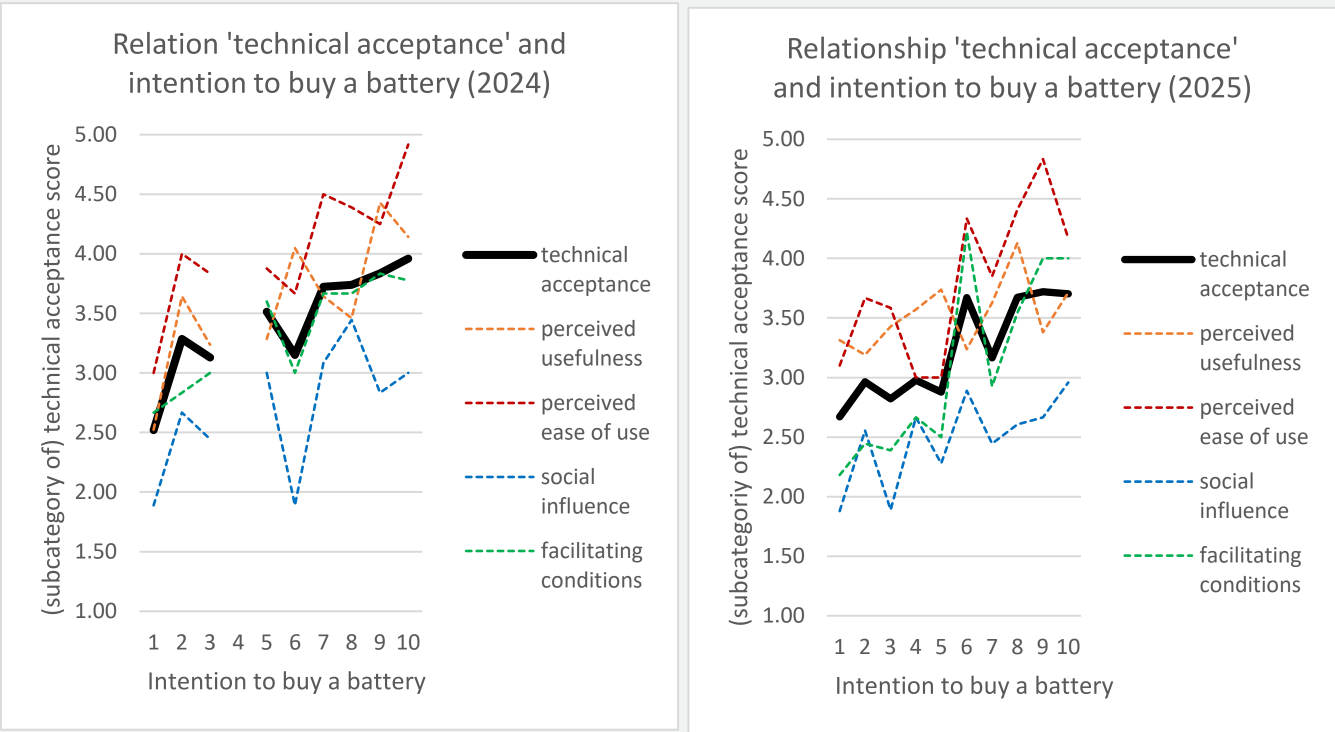


Figure 13: Relationship between the 'technical acceptance' score and the intention to purchase a battery (survey 2024 (left) and 2025 (right)). In addition to the average 'technical acceptance' score per intention score, the four underlying sub-dimensions are also shown.

The relationship between the intention to purchase a battery and the 'technical acceptance' score is clearly evident (and is statistically significant – 2024: ANOVA $F(1,35)=35.914$, $p<0.001$; 2025: ANOVA $F(1,58)=28.223$; $p<0.001$). The more respondents accept the (new) technology of home batteries, the higher their intention to purchase a battery themselves. This relationship applies equally to each of the four underlying sub-dimensions. It is notable that social influence scores low on average, indicating that respondents consider the effect of a battery on their social status to be of little importance. Additionally, the average scores are highest for (perceived) ease of use, indicating that respondents assume a battery is relatively easy to use and understand.

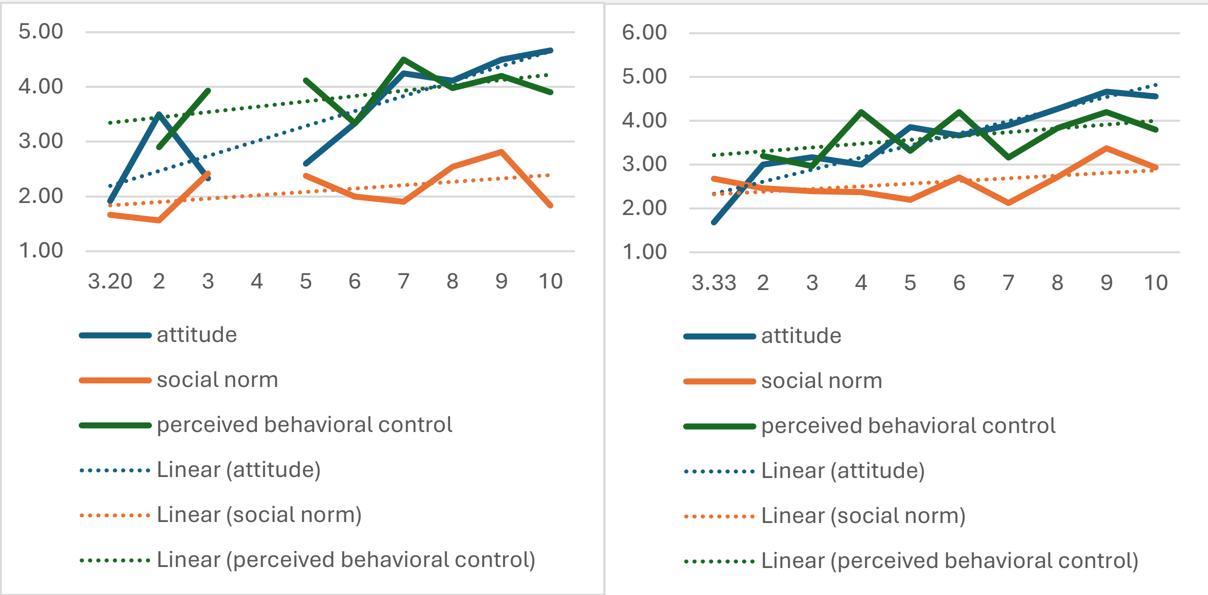


Figure 14: The 3 constituting factors of the Theory of Planned Behavior in relation to the intention to buy a battery. Added are the best fitting lineair trendlines. Left 2024 survey, right 2025 survey.

According to the theory of planned behaviour (Ajzen, 1991) the intention for behaviour is the result of three underlying aspects: attitude, perceived behavioural control and social norms regarding/towards the behaviour. These three aspects were also measured in the surveys and the results are depicted in figure 14. As can be seen the relationship between social norms and the intention to buy a battery is weak (in accordance with the social influence factor from the technical acceptance model as discussed above), as is the relationship between the perceiver behavioural control and the intention to buy a battery. The relationship between attitude towards a battery and intention to buy one is stronger. In addition, the scores on social norms are relative low, meaning that they do not feel pressure from their others to buy a battery and do not know many other people who already have a battery.

The results on the social influence factor and social norms, indicate that the effect of social factors on the intention to buy a battery is limited, which in part can be due to the relatively low score. Increasing the social norms (e.g. by communicating more on the usefulness of batteries and also by an increase in the number of battery owners), could increase the intention to buy a battery. Also it shows that the perceived behavioural control (whether people have the idea that they are able buy a battery) is relatively high and is not a large factor in prohibiting further battery dispersal. Attitude seems to have the largest influence.

Results: Interviews with residents of Ansen (2023)

As part of the broader monitoring and evaluation activities regarding residents of Ansen, an initial round of interviews was conducted, before participants were selected for the home battery pilot. This step was designed to understand the community context in which the project takes place by exploring residents' baseline knowledge, attitudes and expectations.

During May and June 2023, semi-structured interviews were conducted with 13 residents of Ansen. The local energy cooperative recruited respondents to be interviewed by means of their newsletter that was distributed to all residents. A total of 45 households reacted to that from which a random sample was selected. Importantly, these respondents were not selected because they intended to participate in the battery pilot, but rather to provide insight into the general population of Ansen.

Interviews took place either face-to-face or via video call and followed a predefined topic list. The main themes included: knowledge of the energy system and energy contracts; attitudes towards the energy transition and the NO-GIZMOS project; expectations regarding participation in the project; wishes and requirements related to a potential home battery and perceived local social cohesion.

The sample included residents from different age groups, although older participants were relatively strongly represented: six participants were aged 64 or older, and five were between 50 and 64. One participant was around 50 and one was younger than 40. As for educational background, six participants had completed tertiary education (HBO+), four had completed secondary vocational education (MBO) and three had completed junior secondary vocational education or below (LBO or below).

Figure 15 shows how the interviewees perceive social cohesion within the village. Most respondents indicate that they experience at least an average level of social cohesion. Only a small number of respondents perceive social cohesion as low. This suggests that Ansen is generally experienced as a reasonably socially connected community.

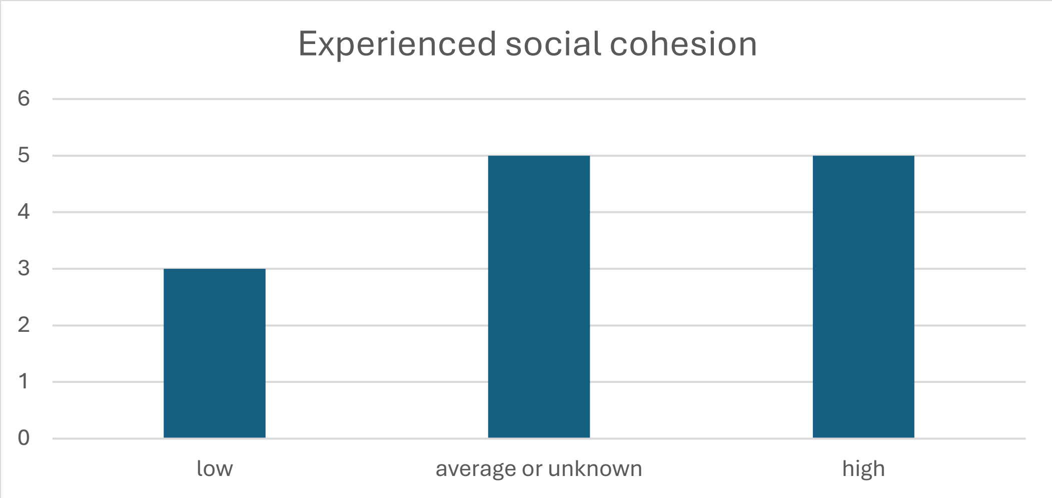


Figure 15: the experienced social cohesion of residents of Ansen

The attitude of the residents in Ansen towards the energy transition, as was already shown in figure 8, is considerably positive. On top of that, most interviewees perceive an average to above average level of involvement in sustainable energy, as shown in figure 16. This indicates that sustainability is already a visible topic within the community.

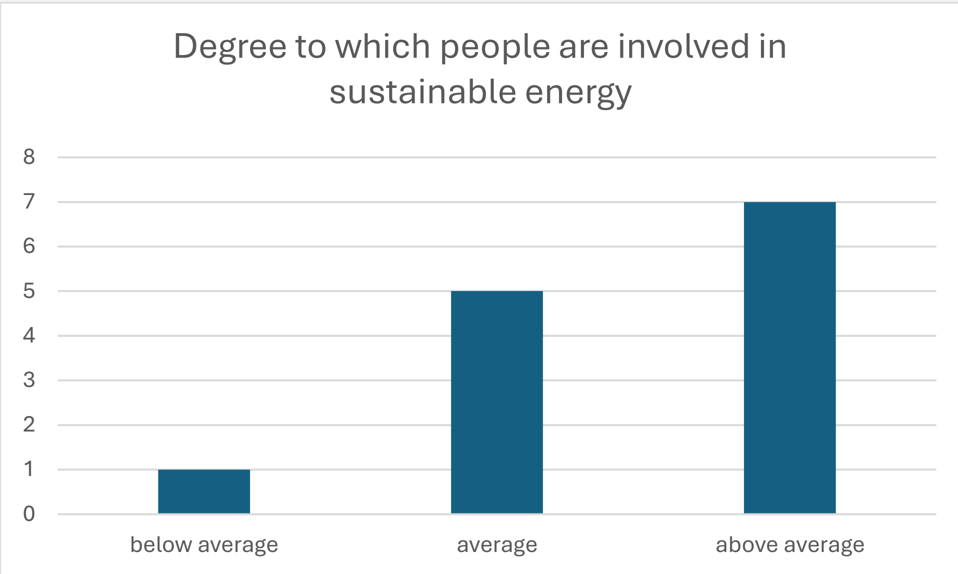


Figure 16: The degree to which people are involved in sustainable energy in Ansen

Regarding the home batteries, most interviewees express a positive attitude toward the technology, as was already shown in figure 7. Only a few respondents report a negative attitude. These result suggest that, even before the start of the pilot, home batteries were generally viewed in a favorable manner by residents of Ansen.

Despite the generally positive attitudes described above, respondents report relatively limited knowledge about the energy system. As shown in figure 17, most interviewees indicate that their knowledge of energy prices and energy contracts is average or below average. This suggests that while residents may support the energy transition, detailed understanding of the functioning of the energy system is less widespread.

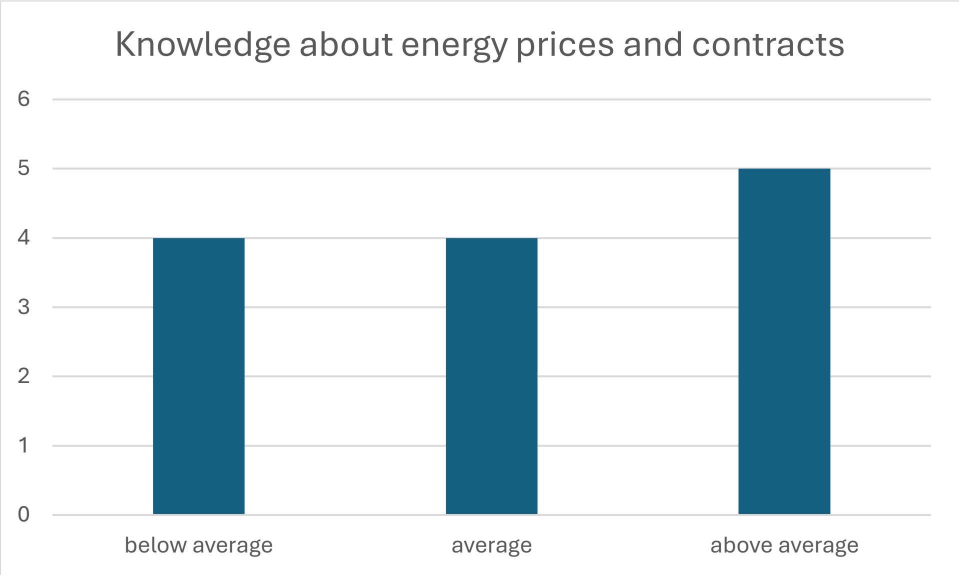


Figure 17: The perceived knowledge about energy prices and contracts of residents of Ansen

Figure 18 shows whether respondents would consider participating in the project. Most interviewees indicate that they would be willing to join, while a smaller group remains uncertain or says no.

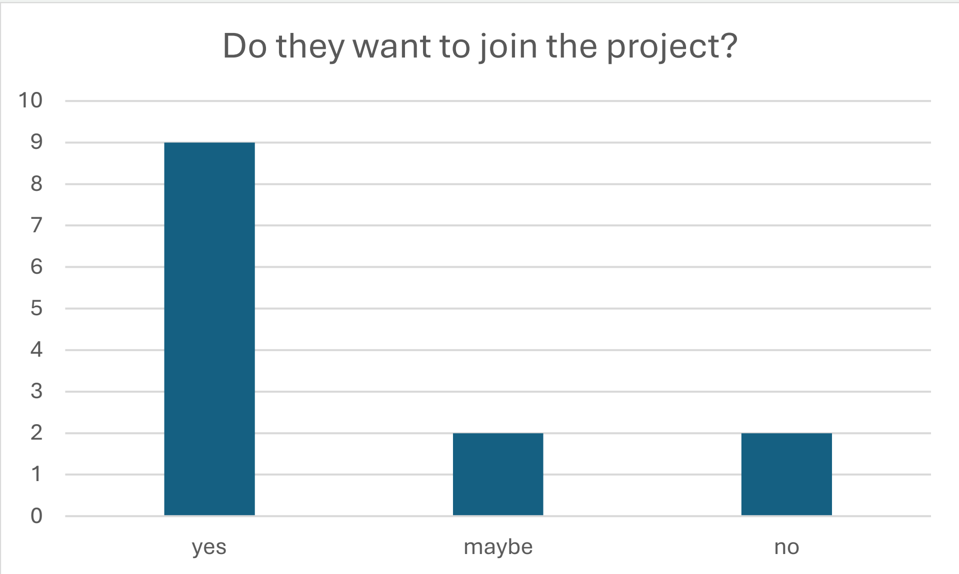


Figure 18: Whether residents of Ansen would like to join the rest of the NO-GIZMOS project.

In addition to willingness to participate, respondents were asked whether they would be able and willing to make a financial investment in a home battery (figure 19). The figure shows that a relatively large group considers itself financially able to invest. The willingness to invest slightly differs but is similar to the ability.

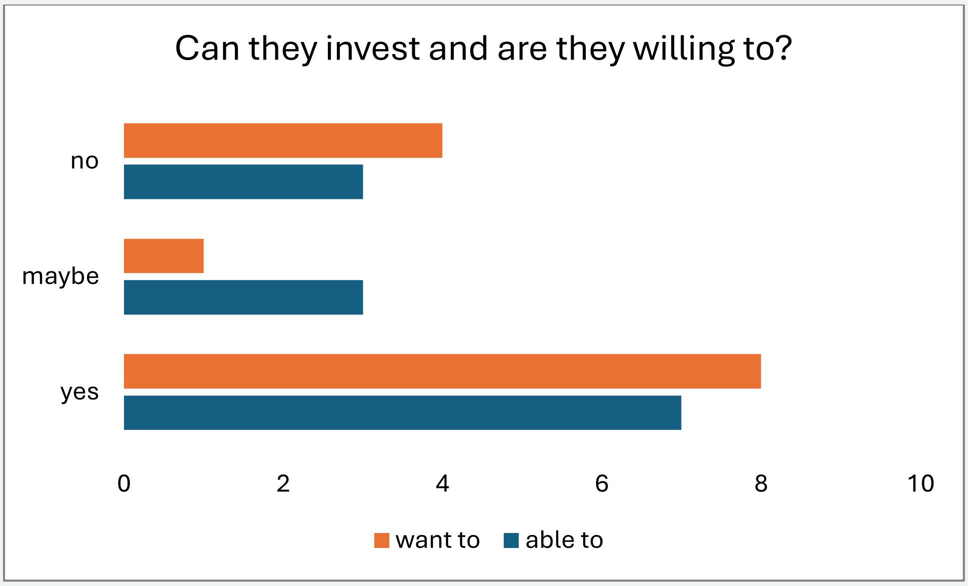


Figure 19: The ability and willingness to invest

Figure 20 summarizes the wishes and requirements mentioned by respondents regarding a potential home battery. A notable result is that many respondents indicate that they currently have no specific wishes or requirements. This finding is consistent with the previously observed limited knowledge about home batteries. Among the wishes that are mentioned, safety is an important theme, particularly with regard to fire risks. In addition, respondents mention practical aspects such as avoiding noise pollution and gaining insight into the battery's operation.

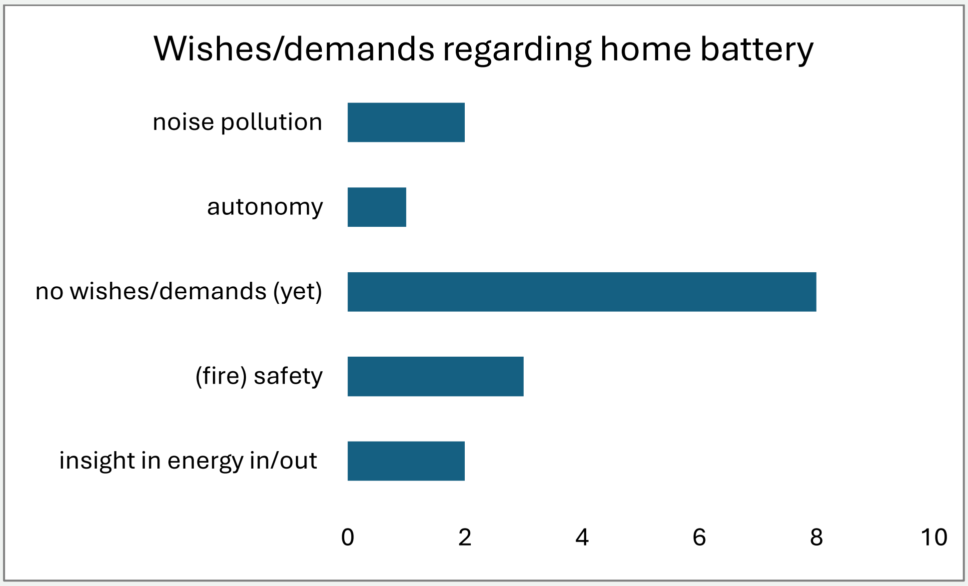


Figure 20: The wishes and demands regarding a home battery

Additionally, figure 21 shows the expectations respondents have about participating in a project involving a home battery. Environmental benefits are mentioned most frequently, suggesting that many respondents expect the project to contribute to sustainability. Other expectations include increasing energy self-sufficiency, supporting the electricity grid, or achieving some financial benefit. At the same time, several respondents indicate that they are unsure what exactly to expect, again reflecting the relatively familiarity with the technology.

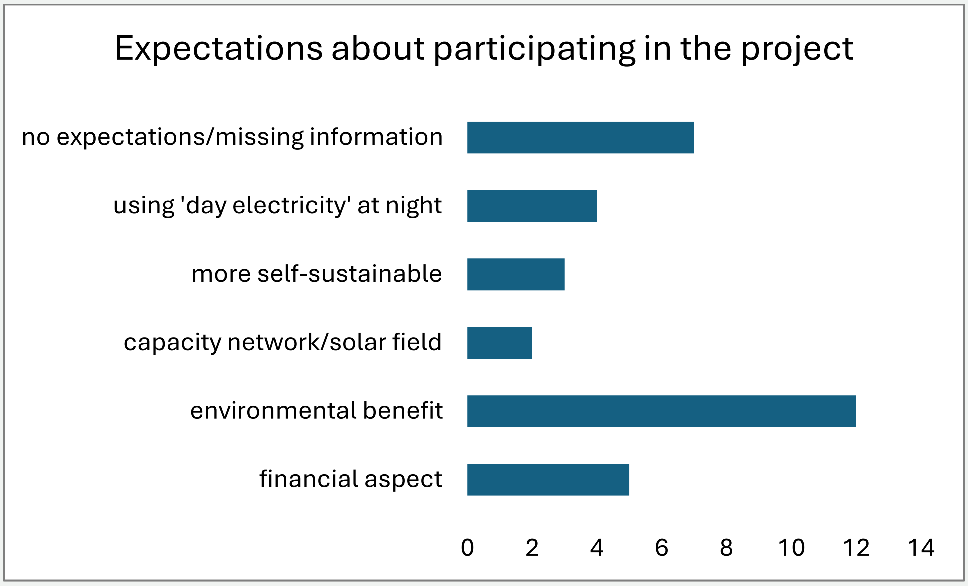


Figure 21: Expectations regarding participating in the project.

In addition, participants mentioned concerns about the origin and recyclability of battery materials, with a preference for materials sourced from the Netherlands or the European Union. Questions were also raised about social justice. Some respondents expressed suspicion towards institutions and dissatisfaction with government sustainability policies. Lastly, a need for quick assistance in case of malfunction of the home battery was also mentioned as important conditions for participation.

Overall, the interviews suggest that the local context in Ansen is characterized by a relatively older, and comparatively highly educated population with generally positive attitudes towards the energy transition and the NO-GIZMOS project. Many residents appear to have the financial means and physical space to consider participation, and there is a clear motivation to contribute to sustainability.

At the same time, knowledge about the energy system and its problems within it is limited. Participants do not experience direct problems related to the energy system and have little knowledge about batteries in general and their potential financial and environmental benefits. Notably, the impact on the environment and local society is considered more important than financial profit and limited financial losses could be acceptable if environmental or community benefits were achieved. The relative lack of knowledge and familiarity with batteries does not withhold the inhabitants to participate in the study.

Results: Interviews at the end of the project (2025)

5.1 Battery noise

Regarding the physical aspects of the battery, most interviewed participants (5 out of 8) indicated that they find the battery noisy (figure 22). However, these 5 participants also noted that they did not personally experience any inconvenience from this, as the battery's location meant the noise was not disruptive to them. In addition, 2 participants indicated that they found the battery noisy and were explicitly negative about it: they would not want to purchase this battery themselves for this reason. Finally, one participant indicated that they found the noise of the battery particularly disruptive, because at those moments there was too little insight into exactly what the battery was doing.

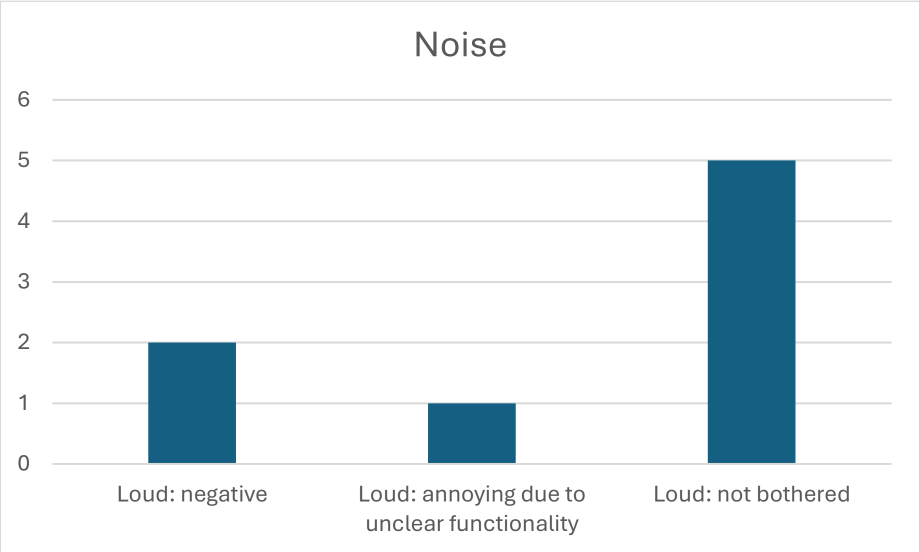


Figure 22: perceived noise pollution produced by the home battery

5.2 Light

All interviewees (n = 8) indicated that they did not find the light emitted by the battery to be bothersome.

5.3 Heat

Most respondents indicated that they did not experience any discomfort from the heat emitted by the battery (n=7) (figure 23). However, one participant clearly stated that the battery's heat output was disappointing and that they experienced this as an obstacle.

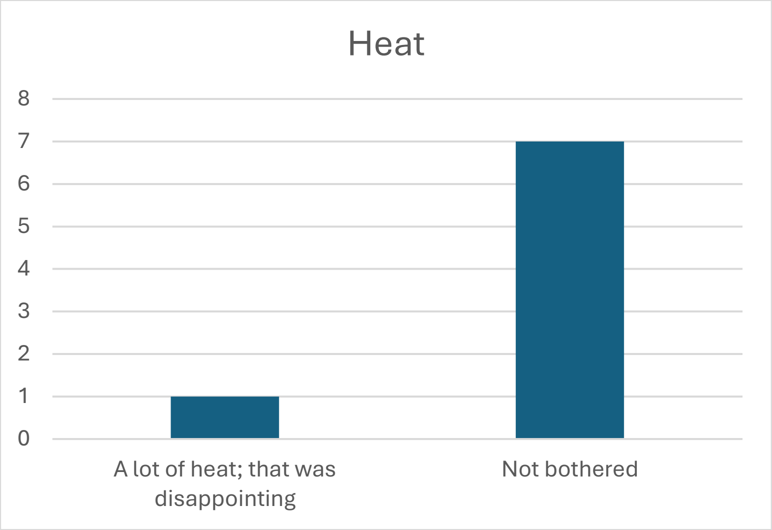


Figure 23: The perceived heat produced by the home battery

5.4 Size

The size and shape of the battery does not seem to be an issue for two of the interviewees (figure 24). Additionally, four participants said that they thought the battery was very large, but they did not see it as an obstacle. For example, because they have enough space for the battery in their home. Finally, two participants clearly stated that they found the battery too large. One participant specifically mentioned that the issue was the placement of the batteries, which requires more free space than the batteries actually occupy, since nothing can be placed directly next to these batteries.

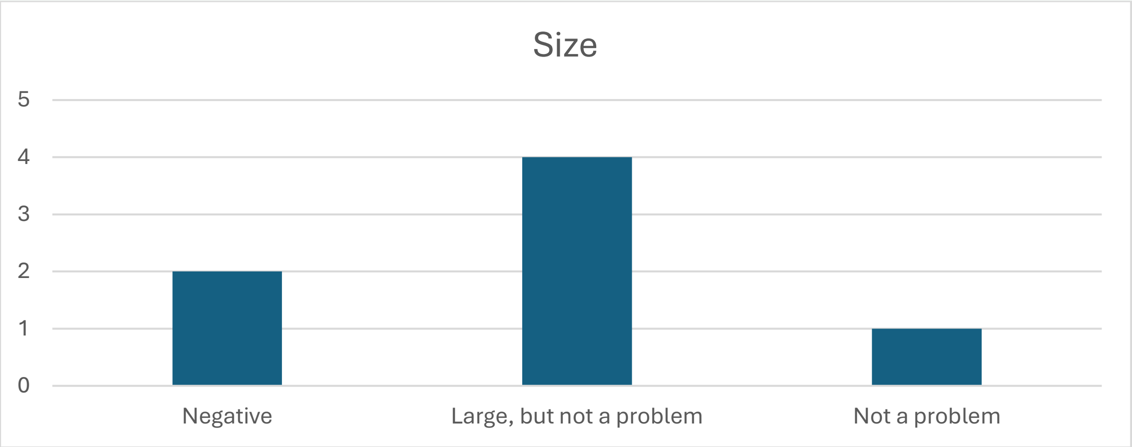


Figure 24: The experiences with the home battery regarding its size

5.5 Barriers

We have seen above what participants thought of the physical aspects of the battery, but what other barriers did they encounter during the project? Two participants clearly indicated that they experienced the physical aspects of the battery, such as the noise, heat emission, or the battery's size, as a barrier (figure 25). Service-related issues, such as installing the battery, troubleshooting malfunctions, and performing maintenance, were the next most frequently cited obstacles: a total of four times. Additionally, three participants indicated that they found it an obstacle that they lacked sufficient insight into exactly what the battery does on a daily basis. They would have liked more insight into the (daily) monitoring. Finally, two participants reported that they experienced battery malfunctions as a barrier. One participant, who cited both the lack of monitoring and the lack of service as barriers, put it this way:

“They called me once because they wanted to come by to perform maintenance. But I’ve never seen them.” […] “My general feeling about having a battery in my house that does all sorts of things and that may or may not be maintained. Yeah, you know, that doesn’t sit well with me, so I really don’t like that.”

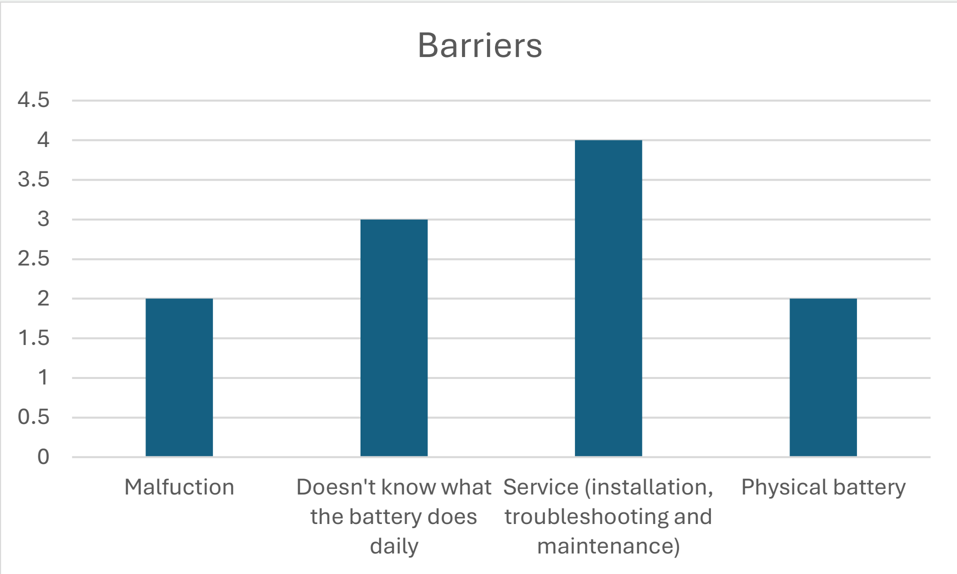


Figure 25: The encountered barriers during the project

5.6 Satisfaction Rating

The average score given by participants for the battery is 6.9 (figure 26). The scores range from 5 to 8. The most frequently cited reason why participants did not give a higher rating was that they lacked sufficient understanding of how the battery works. In addition, two participants gave a lower score due to a physical hindrance (noise/heat). One participant cited the lack of influence over the control system as the reason for a lower score, and finally, one participant cited the lack of reliability as the reason.

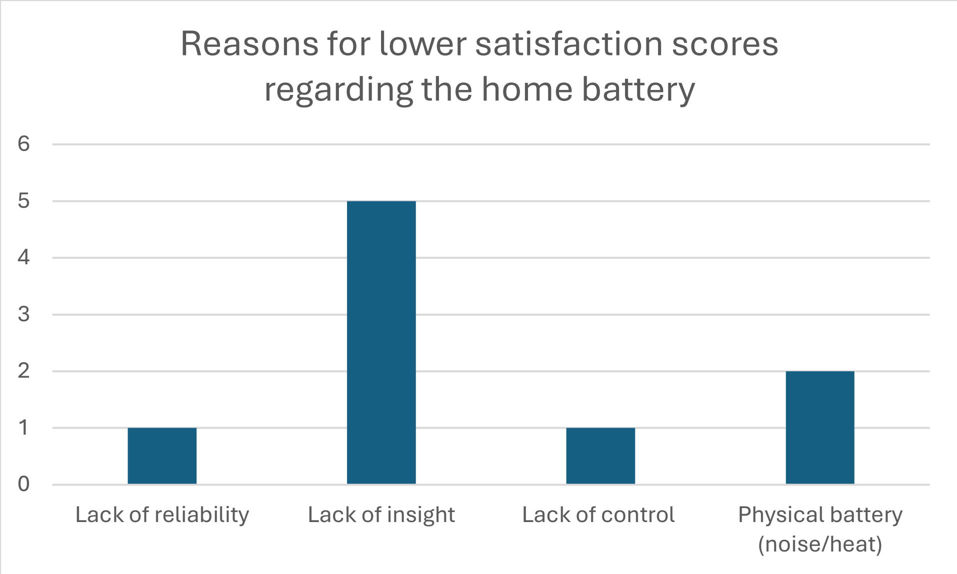


Figure 26: Reasons for lower satisfaction scores regarding the home battery.

Satisfaction rating for battery results

Three participants found it very difficult to rate the battery's results: they indicated that they lacked insight into the battery's results (particularly regarding what the battery specifically meant for them personally).

Four participants indicated they were positive about the results because of what the battery achieves for the community, namely reducing grid congestion on the power grid. However, three people do not consider the battery to be the best investment and therefore gave a lower rating. This is also shown in figure 27.

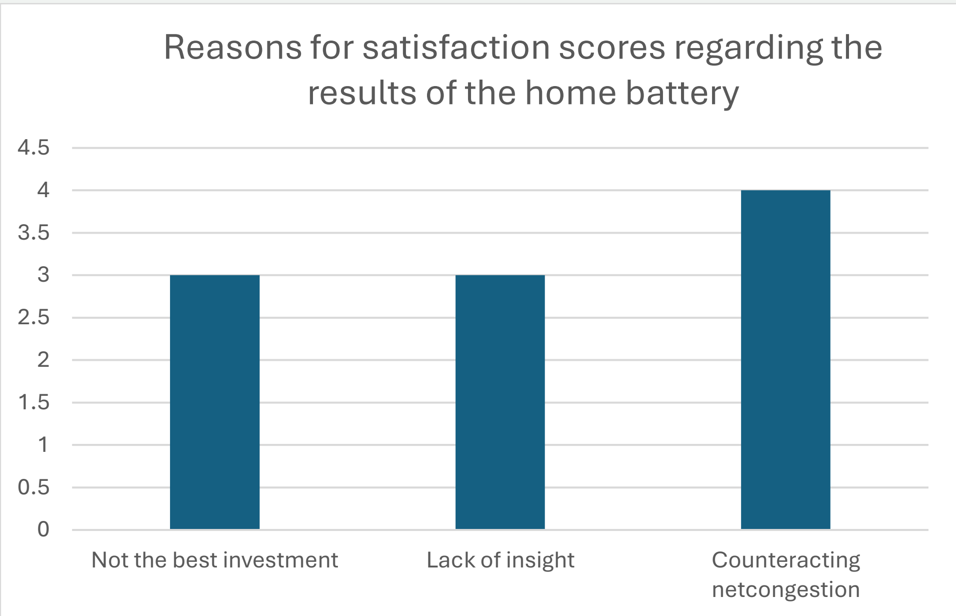


Figure 27: Reasons for satisfaction scores regarding the results of the home battery

5.7 Scenarios

Familiarity with battery management methods

Almost all participants (n=7) indicated that they were at least somewhat familiar with the different ways of controlling the battery. One participant did note, however, that it was unclear which scenario was being run at any given moment, even though this was information that this person would have liked to have. In addition, only one participant indicated having little sense of the differences between the control methods.

Impressions of control strategies

Two participants indicated that they did not really have an impression of the different control strategies, with one person stating that this was due to a lack of transparency in the results. Two people indicated a preference for the control strategy focused on personal usage. Two people indicated that they were positive about the results (reducing grid congestion). Finally, it is mentioned twice that, in the context of the study, personal opinions about the control methods are of secondary importance.

Satisfaction with personal insight

Participants' opinions are divided when it comes to satisfaction with their understanding of the battery. Four participants indicate that they are satisfied with their own understanding. For example, they mention that they are satisfied with the feedback they received on the results. In addition, 4 participants indicate that they would have liked to have had more insight into the battery; this relates, for example, to monitoring (what the battery is doing at a specific time of day). However, there are various nuances in the responses. For instance, one person notes that the updates regarding the results of the control signals were communicated well. Another emphasizes that he understands that insight into the battery's operation was not a research objective. After all, the research focused on the scenarios. But in a "personal" battery, greater insight would certainly be important to him.

The fact that people indicate they would like more insight into how their battery works does not automatically mean that they are currently (within this project) dissatisfied with the insight they currently have. Rather, it seems that for some participants, this becomes particularly important when it comes to their own battery. Consequently, insight into how the battery works could be an important factor for these people when purchasing one.

Understanding the battery's day-to-day operation

Five participants indicated they have no insight into the battery's daily performance, with two of them describing the battery as a "black box." Of the five, three participants explicitly stated that they would have liked to have more control (if they owned the battery). One of the five participants noted that transparency improved when a dashboard became available, but that its interface was very confusing. Another participant, who noted that the daily function is indeed visible in the dashboard, also mentioned that the interface is cumbersome to use. Finally, two participants indicated that they do not concern themselves with the battery's daily function.

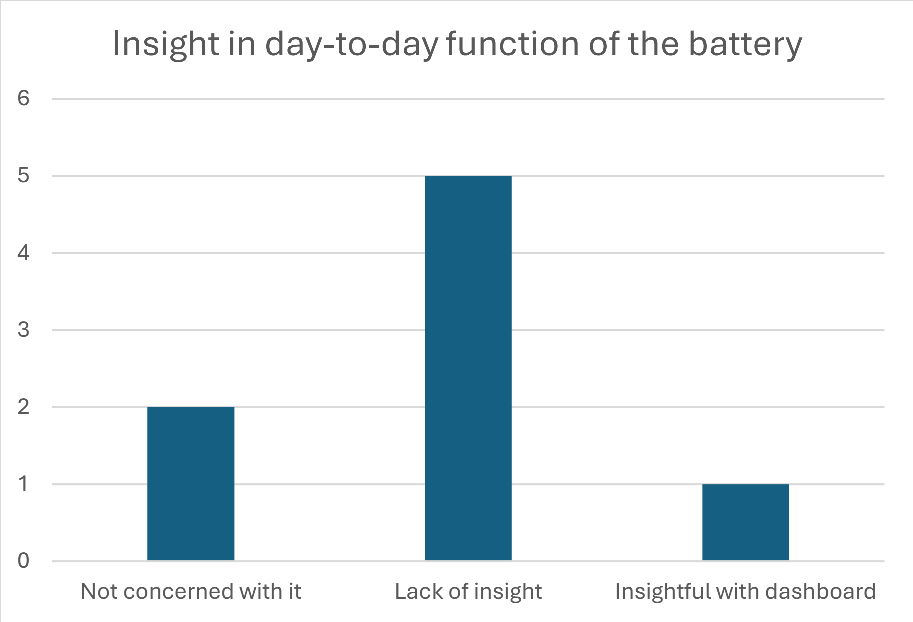


Figure 28: Insight in day-to-day function of the battery.

Results of the interventions

Six participants indicated that the results of the various interventions had been clearly communicated to them. Two participants indicated that these results were not (yet) clear enough; one of them noted that the results communicated so far still contained some unclear comparisons and that a general final, general conclusion was needed.

Changes in trust in the system

Participants generally provided nuanced answers to the question about changes in their trust in the battery. Often, participants were unable to give a clear-cut answer. This means that the total number of responses exceeds the sum of the number of participants (for example, one participant indicated having little trust in the technology, but trust in the people behind the project).

In total, 6 people indicated that they had gained at least some confidence in the battery. For example, 3 of these responses specifically concerned confidence in the people behind the project, and 1 specifically concerned the technology. In addition, 3 people indicated that they experienced a lack of confidence in at least one specific aspect of the battery. This was due, for example, to a lack of confidence in the technology or a lack of understanding of the battery. Furthermore, 3 participants indicated that their experiences with the battery did not clearly change their confidence in any way.

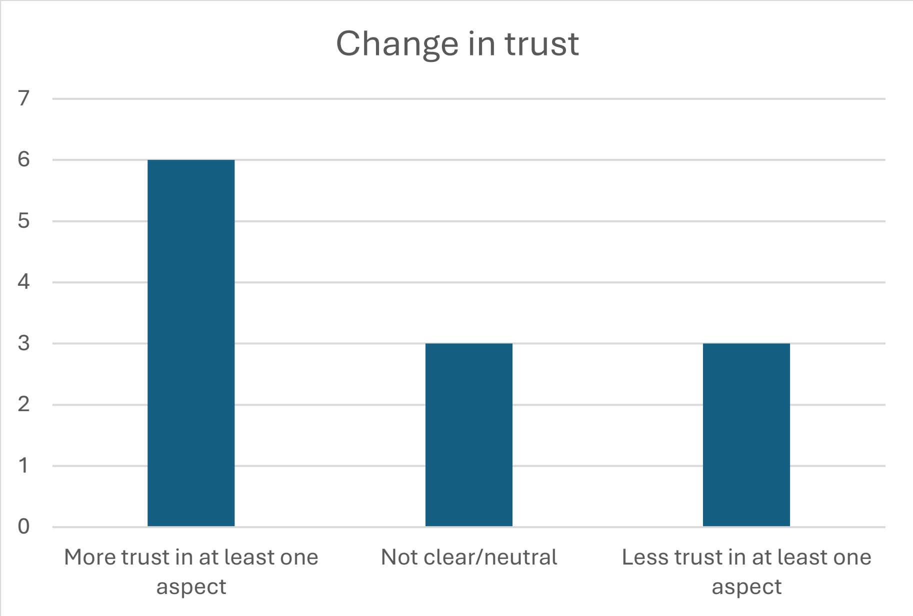


Figure 29: How the trust of participants in the battery system has changed after the project.

5.8 Information provision

All 8 participants indicated that the information provided could have been better for at least one aspect, with 2 participants clearly stating that they were completely dissatisfied with the information provided. These participants would have liked to have had a better understanding of how the battery works. Participants also mentioned a number of aspects they perceived as lacking in the information provided, such as a lack of insight into the battery (mentioned 4 times), insufficient clarity regarding participant compensation (mentioned 2 times), insufficient response to questions (mentioned 2 times), the information could have been more structured (mentioned 1 time), the level of information could have been better tailored to the target group (mentioned once), and the information could have been more transparent and clearer (mentioned once).

In addition, 3 participants indicated that the provision of information did improve over time, particularly through the creation of the group chat and the organization of information sessions.

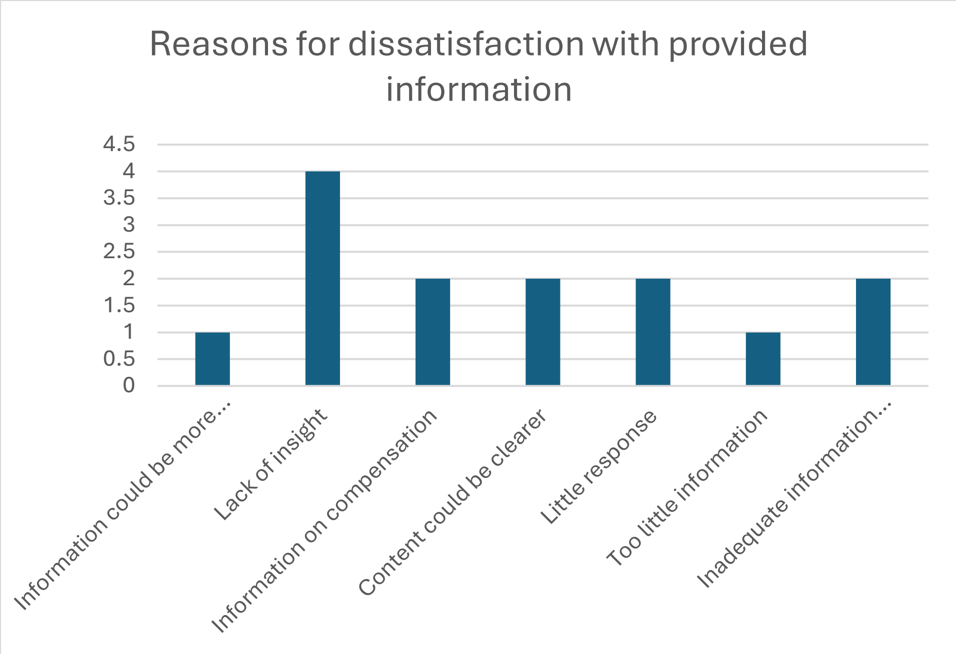


Figure 30: reasons for dissatisfaction with information provision

Preference for the format of information

When it comes to the format in which information is communicated, four people indicated that they were satisfied with the current approach. For example, they mentioned that they were satisfied with the information sessions and the group chat that was created.

Three participants indicated that they missed having a clear and user-friendly app to monitor their battery. One participant specifically mentioned that he would have liked to take "battery lessons" to gain a better understanding of it.

In addition, three participants mentioned that they would prefer a combination of WhatsApp (for short updates, such as information about starting a new intervention) and more detailed updates via email (newsletters). On the other hand, one participant specifically indicated a preference for email and would rather not use WhatsApp.

Finally, one participant noted that communication regarding the format could have been better. For example, a pre-agreed communication calendar could have been used.

5.9 Battery results

Individual results (self-sufficiency, electricity costs, personal consumption)

Regarding the individual results (such as the battery's impact on self-sufficiency, personal consumption, and electricity costs), all participants (n=8) indicated that this information is not clear to them. Of these 8 participants, 2 clearly state that they would have liked to have this information, with one of these two participants noting that this is transparent with a battery from, for example, Zonneplan.

Four other participants mention that it is possible these results were presented or available, but that they themselves no longer recall exactly what the results were. Of these four participants, one notes that these results are secondary to the (collective) study. In addition, two of the four people noted that individual costs are not transparent because they purchased several new energy-consuming devices during the battery's operational period (such as a heat pump).

Finally, three people noted that the costs of the battery's electricity consumption perhaps could have been transparent, but that they had not looked into this themselves.

Grid Congestion Results

Regarding the results on grid congestion, most participants (n = 7) indicate that this information has been communicated to them and that these results are clear to them. In addition, one participant indicated that this is not clear, although this person would like to have a better understanding of these results.

Retention/Expansion/Replacement

Four participants indicated they are open to retaining the battery they are currently using as part of the project. Of these four, three emphasized that their decision depends heavily on the offer they will receive. This concerns both the financial aspect (the price of the battery) and after-sales service, particularly regarding the handling of malfunctions. In addition, two of these four participants indicate that gaining a better understanding of how the battery works would be a necessity for them.

Furthermore, 7 participants indicate that they would be open to purchasing a new battery once the project is completed. 4 of them specify that they would like to use it in a way that is tailored to their own energy consumption, for example with the option for off-grid use. 3 participants indicate that they would like to see the battery more closely integrated with the overall energy system in their home. In addition, two participants indicated a need for a larger (in capacity, not size) battery, and two others mentioned that they would consider purchasing an electric car and using its battery as a home battery. Finally, one participant indicated that having more confidence in better communication about the battery would be an important condition for purchasing a new battery.

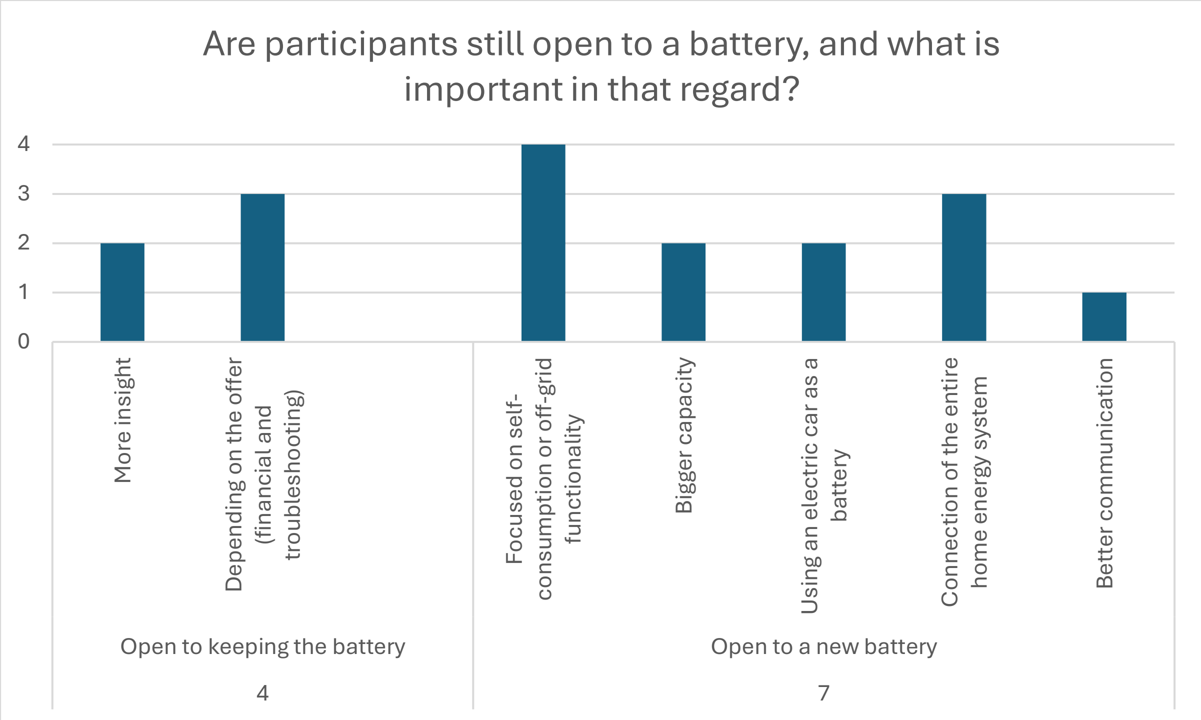


Figure 31: Whether participants are still open to a battery, and what they consider important in that regard.

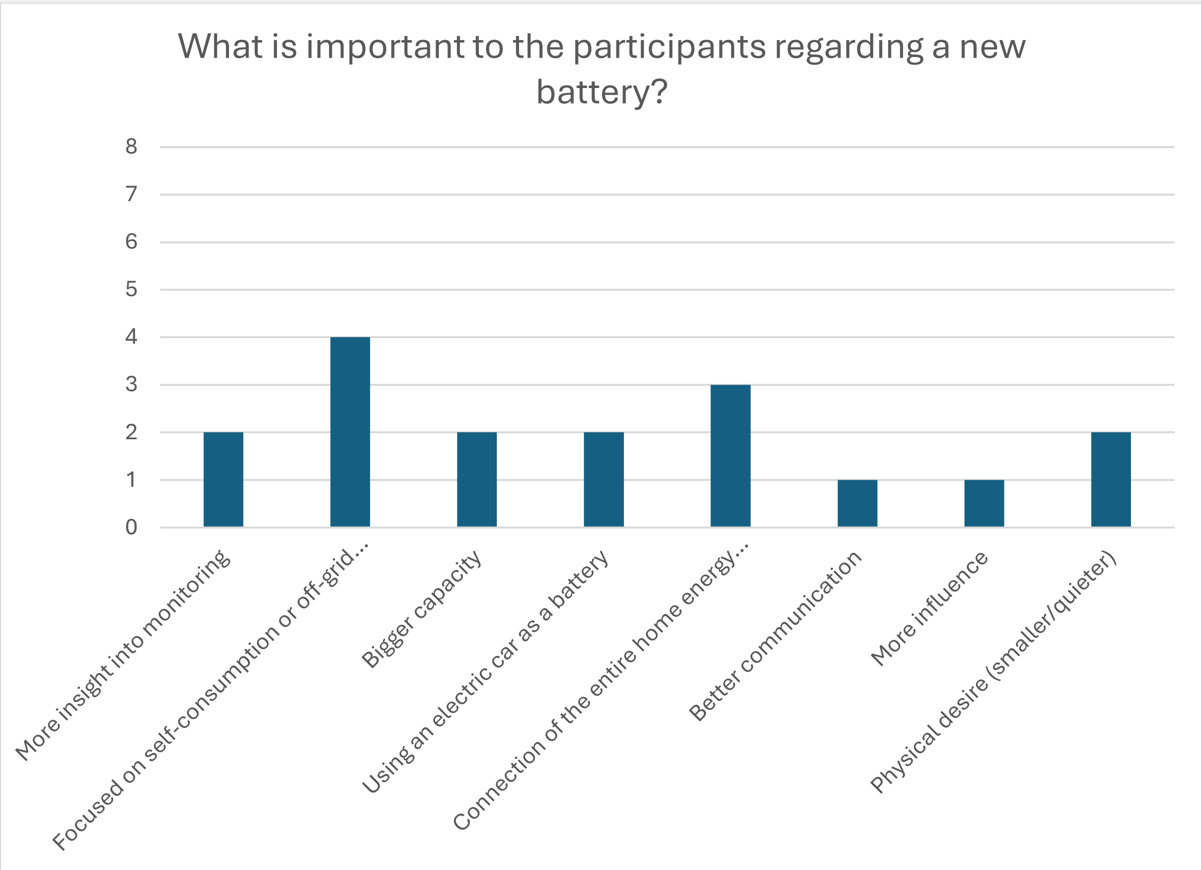


Figure 32: Important aspects for participants regarding a new battery

Attitude

Most participants indicate that their overall opinion of home batteries has not changed significantly as a result of their experiences within the project. Two participants state that the project has helped them better understand the importance and necessity of a home battery, for example in relation to increasing grid congestion. One participant, on the other hand, indicated that they have become less positive about home batteries. This is related to their specific experiences with this particular home battery (including its size, noise, and heat output), as well as broader developments in the battery market. However, this participant did indicate that they are open to using an electric car battery as a home battery.

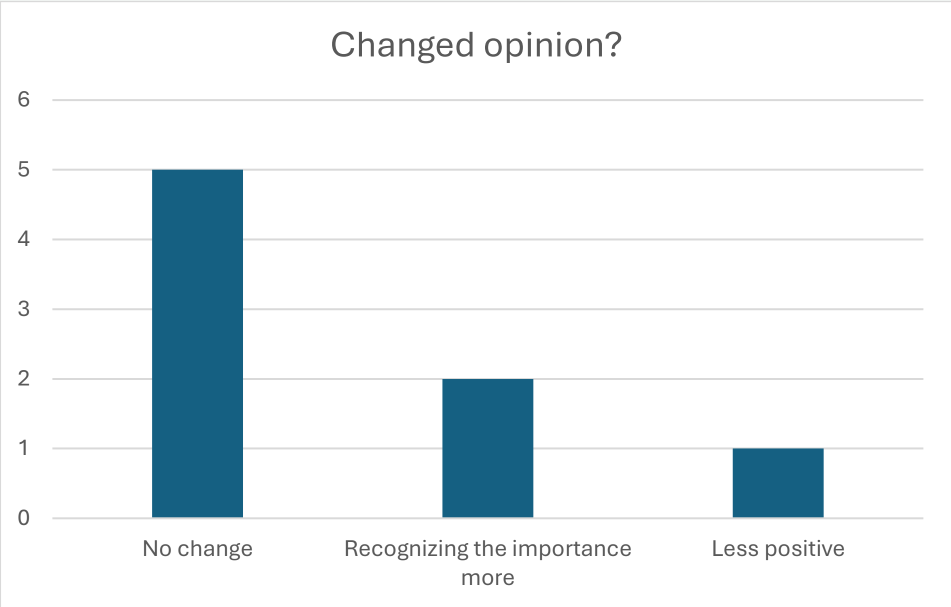


Figure 33: Whether the project changed the participants' opinion of home batteries.

It is noteworthy that participants did not have exclusively positive experiences with the project, but that these (partly negative) project experiences do not appear to directly influence participants' broader views on home batteries in general. Negative experiences included, for example, the lack of adequate information at various points and the absence of proper monitoring. Nevertheless, most participants appear to remain predominantly positive about the use of a home battery in the future, although possibly in a different form (such as an electric vehicle battery). However, the factors they consider important in this regard vary greatly from participant to participant.

Expectations

Regarding changes in participants' expectations, one participant indicated that he had expected to learn much more from the project and the battery. This participant is clearly dissatisfied that this expectation was not met. Another participant indicated that he had expected to gain more insight into the battery.

In addition, four participants indicated that they had not previously considered certain aspects of the battery, namely that it produces so much noise (three participants) and heat (one participant), that it cannot operate off-grid (one participant), and that there are different ways to control the battery (one participant).

In addition, one participant indicated that they had expected more communication from the project, and one participant indicated that they had not expected that eight batteries could already have an impact on mitigating grid congestion.

New reasons for use

Not all participants can identify a new reason for using a battery. Four participants indicate that a new financial incentive could be a reason, citing, for example, the abolition of net metering, also known as the salderingsregeling. One other participant cites the growing problem of grid congestion as a new reason. In addition, 2 participants indicate that they would also like to use the battery as an emergency power supply, with 1 participant specifically mentioning this in connection with the increasing threat of war.

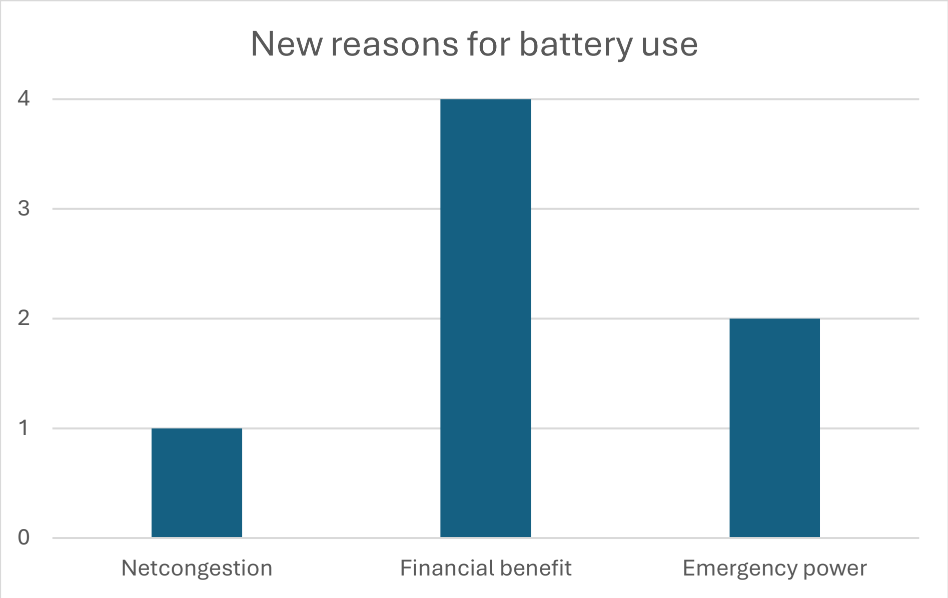


Figure 34: Newly identified reasons of participants for using a home battery.

5.10 Community/neighbourhood

Is the project spoken about/thriving in the community?

The answers given here are not very convincing. Most participants seem to feel that the project is primarily “thriving” among the project participants themselves, and less so among other villagers. Only one participant feels that other villagers are also involved.

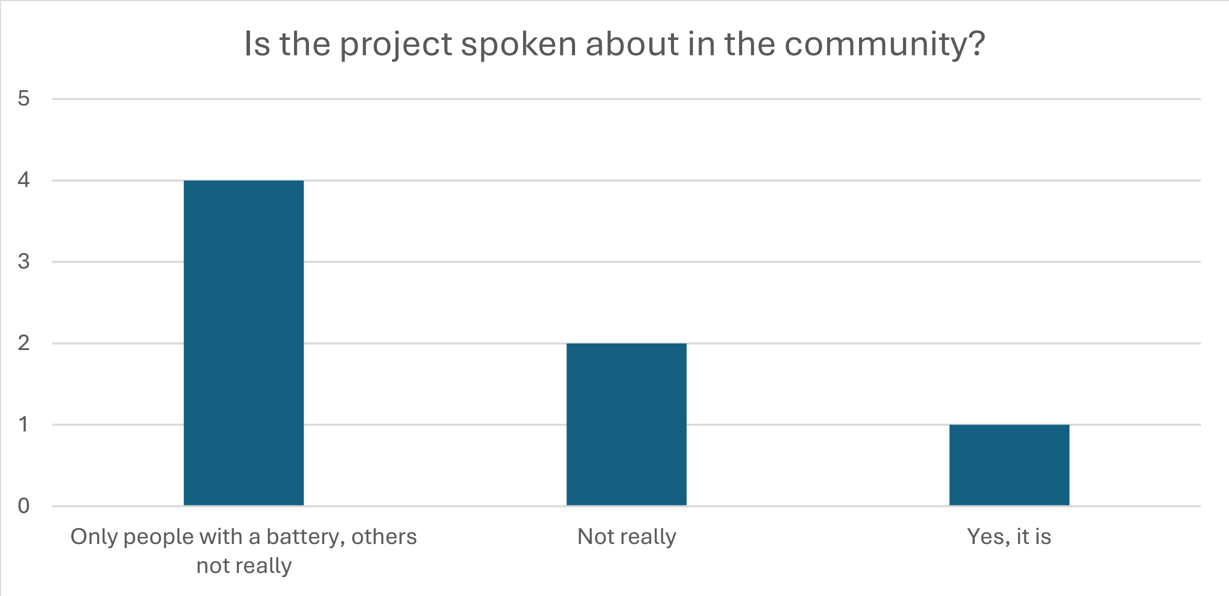


Figure 35: Participants perception of how much the project is spoken about in the community.

Conversations with neighbours

Most participants indicated that they had only occasionally, or even rarely, spoken with neighbours about the battery. When these conversations did take place, they mainly focused on practical aspects, such as the battery's control system, capacity, and noise level.

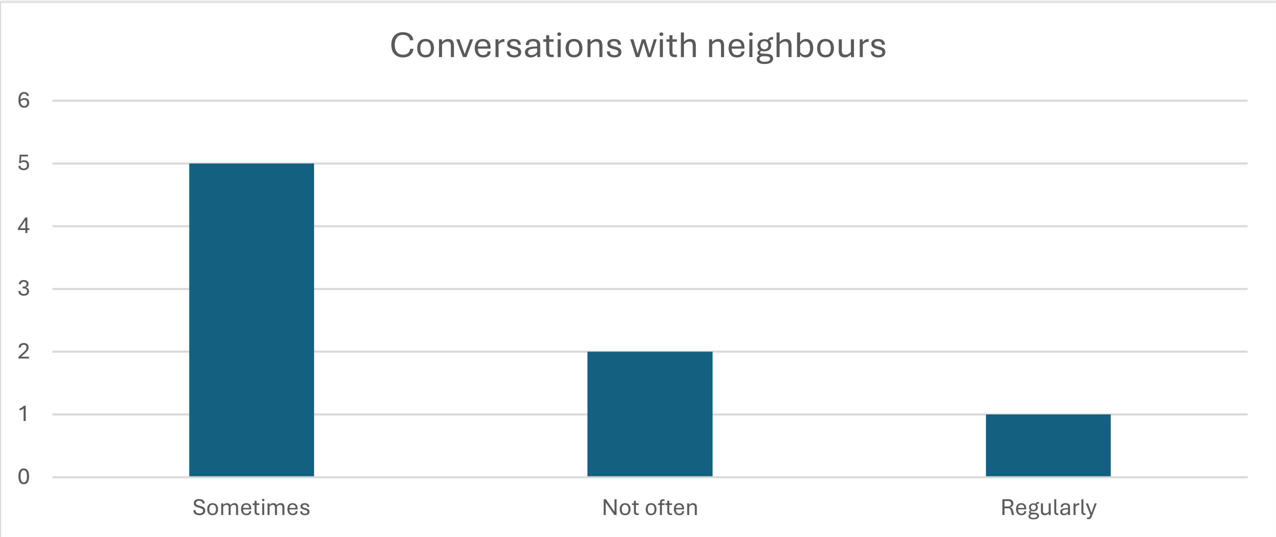


Figure 36: Whether participants speak with their neighbours about the home battery.

Do participants recommend the batteries?

A common reason given for not actively recommending batteries to others is that, from a financial standpoint, they aren't necessarily the best investment. The most common response is that whether or not to recommend a battery depends heavily on the other person's personal situation. Factors such as: 'Does the person have solar panels, and if so, how many? How do they want to manage the battery? What other sustainability measures have already been taken? And where in the home would the battery be installed?’ play a role.

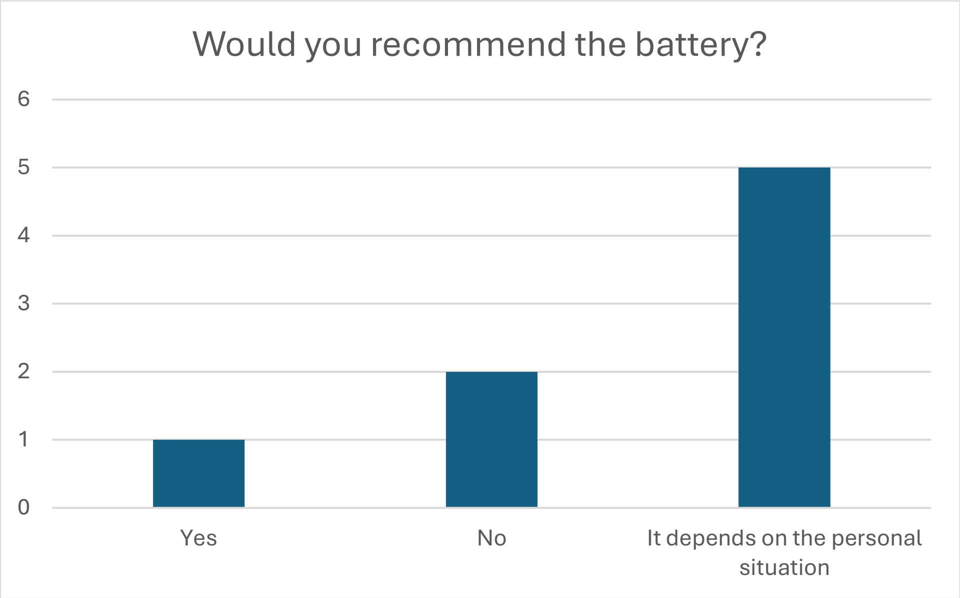


Figure 37: whether the participants would recommend the battery to others.

Adjusting behaviour

Six participants indicated that they had at least attempted to adjust their behaviour regarding energy consumption during specific time periods. One participant noted that they were on vacation during this period, which is why they were not fully successful. Another participant reported that this “behavioural trial” had passed them by and that this was why they were not successful.

Of the 8 participants, 2 indicated that they found this behavioural change easy to implement. 3 participants (including the 2 who stated they did not pay extra attention to their energy consumption within this project) indicated that they were already managing their energy consumption anyway (for example, by running the dishwasher when the sun is shining). Four participants indicated that adjusting their behaviour was at least partially difficult for them. This was due, for example, to the dishwasher not having a timer, or participants not wanting to include their “larger” appliances such as the heat pump or electric stove.

Of the 6 participants who took part in the behavioural change, 3 were very positive about timing their behaviour. They noted that it contributed to their energy awareness. However, one of them indicated that the connection to the battery is still unclear to him; he would like to receive feedback on how this adjustment affected the battery. In addition, one participant indicated that this adjustment felt normal to him, one participant found it took some getting used to, and one participant would prefer to have this fully automated, with high-consumption appliances (such as the heat pump) also connected to it.

Of the 6 participants, 4 indicate that they would like to permanently adjust their behaviour. The remaining 2 participants indicate that they are willing to permanently adjust their behaviour if there were a financial benefit involved.

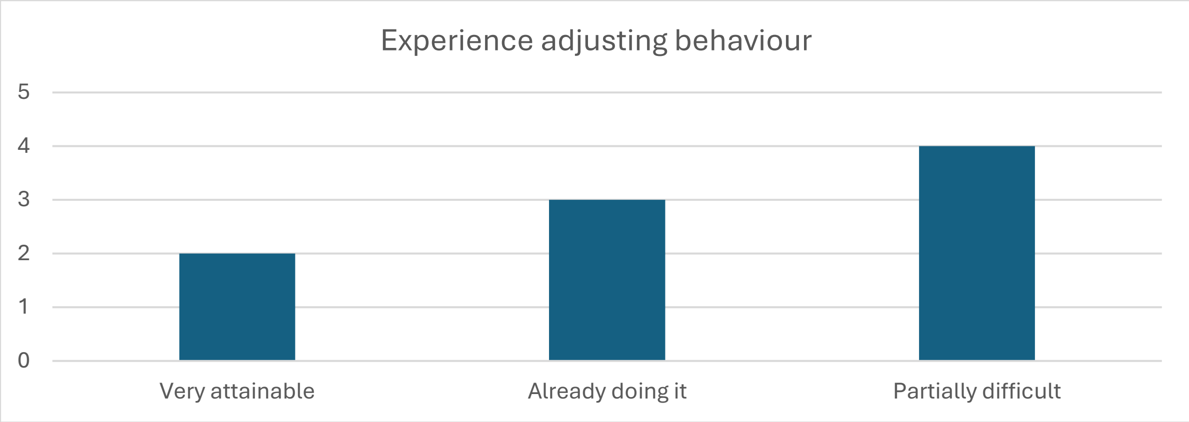


Figure 38: The experience of participants with adjusting their behaviour.

Other

Energy independence

Four participants clearly indicate that energy independence plays a role in their choice of a battery, although two of them emphasize that off-grid functionality is not a requirement. For the remaining four participants, energy independence emerges as a less prominent theme.

Sustainability

In two interviews, it becomes clear that sustainability is an important factor for these participants when purchasing a battery. Two other participants, however, indicate that sustainability does not play a role for them. For the remaining group, the picture is less clear-cut: in one interview, this topic was not explicitly addressed, while another participant indicated that sustainability does play a role, but should not come at the expense of other important aspects.

Cost reduction

For 4 participants, cost savings are a key factor in their decision to purchase a battery. In addition, 2 people indicate that they consider it important to recoup their investment. 2 participants state that cost reductions are secondary to other considerations (such as sustainability).

EnergieKansen

Of the 8 participants, 6 are already members of the EnergieKansen energy cooperative. Of the 2 participants who are not members, one is open to joining. The other participant feels less aligned with the cooperative's objectives, as this person has already made significant sustainability improvements in their home. In response to the question of whether EnergieKansen could do anything better, the following answers were given:

"No, they're doing a great job. I have a lot of admiration for them. In the future, they could perhaps improve their communication about the project."

"Communication could be a bit better at times. They could focus on a wider range of groups, such as people with lower incomes. There might be more opportunities for that group than what's currently being done."

"Even though we aren't members, we still receive regular updates from them. They also organize regular events. So I don't think there's much that needs to be improved there."

"Nothing; they facilitate the project well."

"No, nothing. I'm already a bit further along than the energy cooperative's goal (in terms of making my home more sustainable)."

General observations

There appears to be a distinction among participants regarding different types of engagement. Some people view the battery as a valuable addition to their (electric) household. They are highly engaged and motivated to understand exactly what the battery does. Within this project, this need for insight is not currently being met for them. For this reason, they are currently dissatisfied with the battery. For them, the project will only be considered a success once they gain more clarity about the battery's operation and results.

Other participants indicate that their personal interest in the battery is secondary to the research objective. While they do experience a lack of insight or other obstacles (such as communication issues), they are able to put these matters into perspective somewhat due to the aforementioned factors. They do emphasize, however, that if they were to purchase a battery themselves and thus make their own investment, they would likely be less patient. If they were to purchase a battery, they would need sufficient confidence in good service beforehand—for example, through quick and adequate resolution of malfunctions—and would want more insight into daily monitoring.

Besides that, there is a (small) group of participants who seem somewhat less involved with the battery. They view their participation primarily as making their home available for the study and feel less need to actively monitor the battery or understand exactly what it does.

Results: Behavioural change (UC6, 2025)

As part of Use Case 6, a subset of residents of Ansen participated in a behavioural experiment aimed at assessing the extent to which households are willing and able to adjust their energy consumption patterns. Over a six-week period (22 September – 2 November), participants recorded deviations from their usual energy-related behaviour in structured logbooks. For each reported change, participants described what they did differently, indicated the approximate timing, noted behaviours that were postponed or not carried out, and rated the effort required to implement the change on a scale from 1 to 10.

Behavioural change was operationalised broadly as any self-reported deviation from routine energy use, including relatively minor actions such as shifting the timing of low-energy-consumption-appliance use. Across the six-week period, no major irregularities were observed in the temporal distribution of behavioural change. On average, 53.9% of participants reported at least one behavioural adjustment per day (see figure 39 for the percentages on alle days during the six week period). It should be noted that part of the people that did not change their behaviour already had put their behaviour in line with the peaks and troughs of energy production and consumption before the study. In addition, part of the people not reporting behaviour changes, where not present at their homes, so were simply unable to change their residential energy consumption pattern.

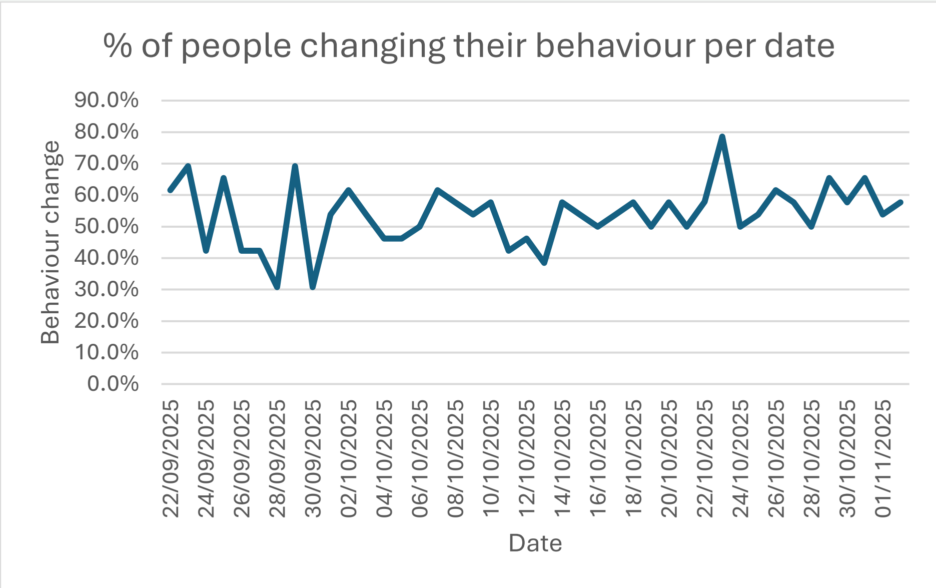


Figure 39: The percentage of participants in the use case 6 experiment that reported to have changed their behaviour, for each of the days within the 6 week period separately.

Over time, the data show a stabilisation of this percentage, with fewer pronounced fluctuations in later weeks. When analysing behavioural change across days of the week, patterns appear largely stable. A slightly higher level of activity is observed on Thursdays, while behavioural adjustments were somewhat less frequent during weekends. This finding contrasts with the initial expectation that participants would have more time to adjust their behaviour during weekends. A possible explanation lies in the demographic composition of the sample, which includes a relatively large proportion of retirees. This group may have more flexible schedules during weekdays and may be less consistently present at home during weekends, although this interpretation remains speculative.

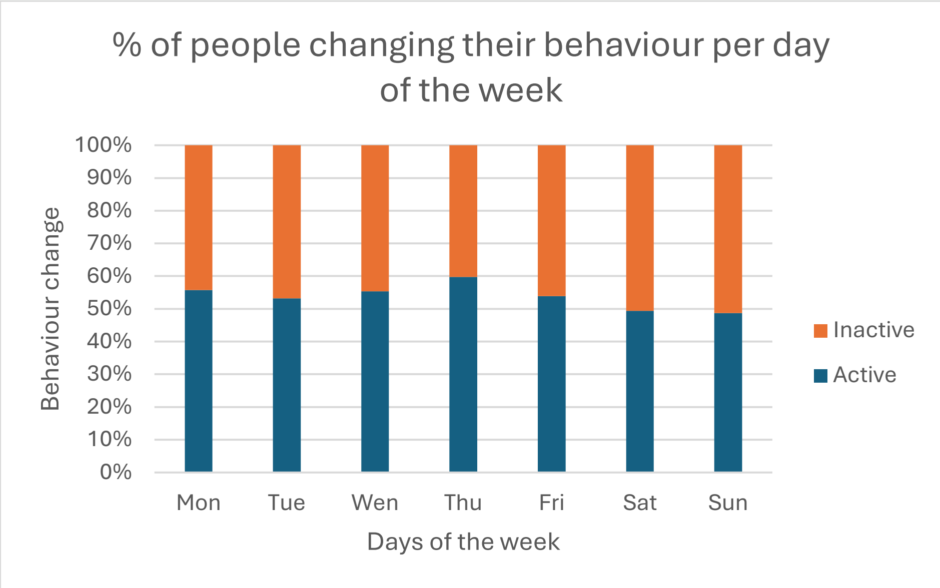


Figure 40: Percentage of people that changed their energy behaviour divided by the days of the week, averaged over all weeks.

Over the course of the experiment, a modest upward trend in behavioural change can be observed. The proportion of participants reporting behavioural adjustments increased from approximately 50.5% in the first week to 58.2% in the sixth week, with the most notable increase occurring between weeks four and five. This development is likely related to increasing familiarity with the experiment. As participants became more accustomed to the reporting procedure and more aware of what constitutes relevant behavioural adjustments, they may have identified more opportunities to modify their energy use.

6.1 Effort

With regard to perceived effort, participants generally reported low levels of effort associated with behavioural change. This may indicate that the required adjustments were indeed relatively easy to implement. At the same time, the consistently low scores suggest the possibility of socially desirable answering, where respondents underestimate or underreport the effort involved. While this may affect the validity of absolute effort levels, the relative differences between conditions remain informative. No substantial variation in perceived effort was observed across dates or days of the week, although slightly higher scores were recorded on Mondays. One possible explanation is that the start of a new reporting cycle, such as beginning a new logbook entry, prompted more deliberate reflection and thus slightly higher reported effort. Over time, a slight increase in perceived effort is visible, which coincides with the observed increase in behavioural change. This may indicate that participants engaged in more frequent or more demanding adjustments as the experiment progressed.

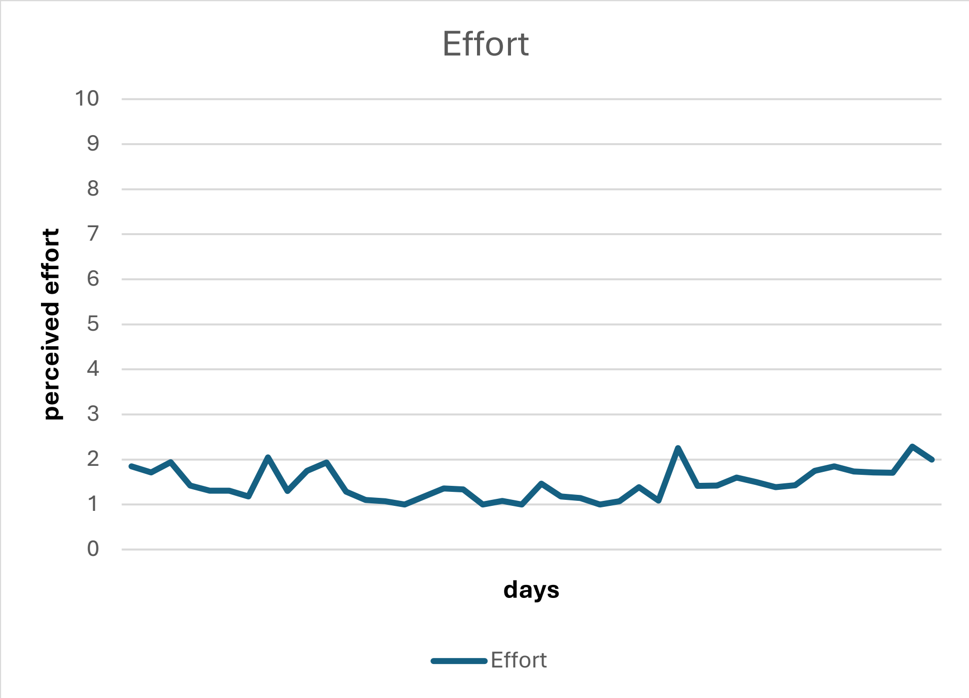


Figure 41: Average perceived effort scores over the days of the six-week period of use case 6.

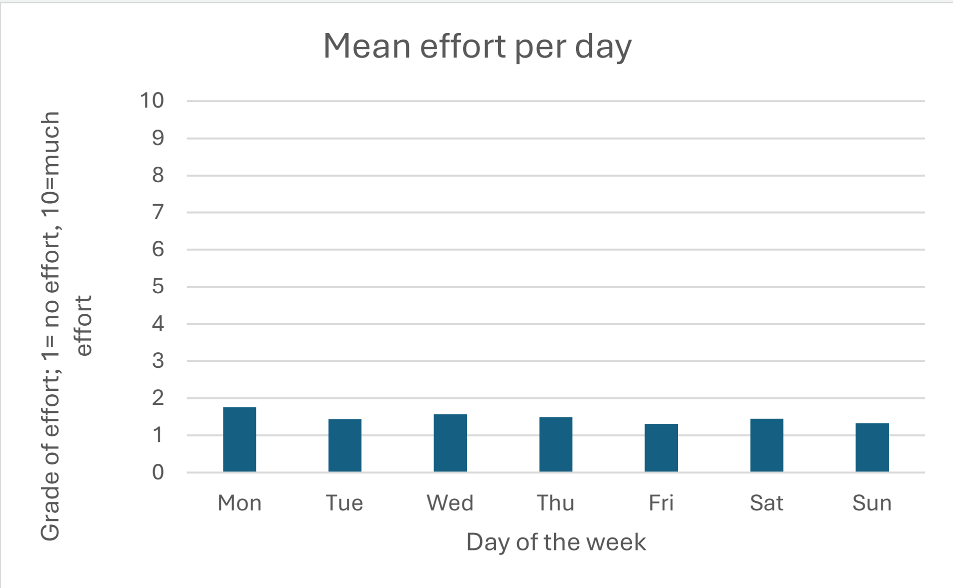


Figure 42: The perceived mean effort per day.

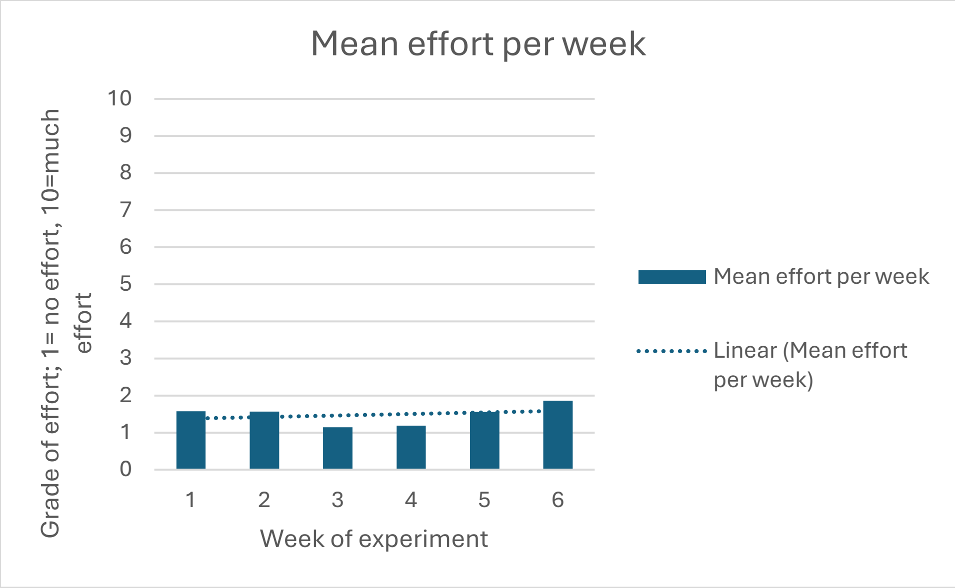


Figure 43: The perceived mean effort per different weeks of the experiment.

In order to analyse behavioural timing relative to peak (red), off-peak (green), and intermediate (grey) periods (as shown in figure 44), several methodological decisions were required. Participants did not always report exact times, instead using general descriptors such as "evening" or "afternoon." These responses were interpreted consistently and conservatively, generally in a way that assumed positive intent where ambiguity existed. While this introduces some uncertainty regarding precise timing, excluding such responses would have reduced the already limited dataset and potentially introduced greater bias. For behaviours spanning multiple time periods, such as electric vehicle charging, classification was based on the start time. If a behaviour began in an off-peak period, it was coded accordingly, even if it continued into a peak period. This approach reflects the assumption that users primarily control start times and that peak loads are often highest at the initiation of an activity. In cases where no end time was provided, only the start time was used as a reference and rounded to whole hours.

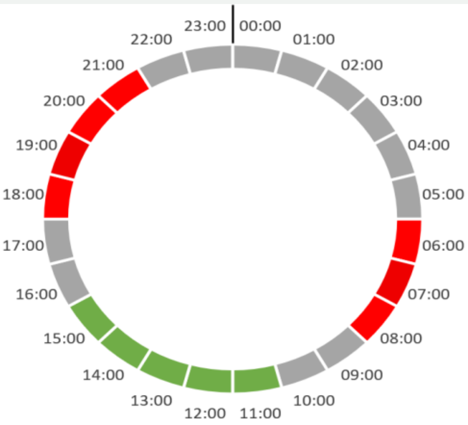


Figure 44: A visualisation of the "red", "green" and "grey" hours, in which red hours are peak hours and green hours are off-peak hours.

Some participants reported behaviours in general terms for an entire week rather than on a daily basis. In these cases, behaviours were distributed across days for analytical purposes but counted as a single behavioural instance in order to limit overrepresentation. In addition, behaviours involving the use of alternative, non-electric energy sources, such as wood stoves, were included as relevant adjustments, as they reduce demand on the electricity grid. Participants also differed in the number of behaviours they reported, with some reporting none and others reporting multiple adjustments. To prevent disproportionate influence of highly active respondents, the analysis was conducted at the level of respondent entries rather than individual behaviours. While this improves comparability, it does not fully eliminate variability between participants and therefore remains a limitation in interpreting the results at the population level.

6.2 Analysis

A key focus of the analysis was the relationship between behavioural timing and perceived effort. When comparing behaviours occurring during peak periods with those in off-peak or intermediate periods, a clear pattern emerges. As shown in figure 45, for behaviours in off-peak periods, 85% of respondents reported the lowest possible effort score. For behaviours occurring during peak periods, this percentage decreases to 59%, accompanied by an increase in slightly higher effort scores, particularly a doubling of responses indicating an effort score of 2. Although these differences are modest, they consistently indicate that behaviours performed during peak periods are perceived as requiring more effort. This finding aligns with expectations, as adjusting behaviour in ways that are less aligned with existing routines typically requires more effort.

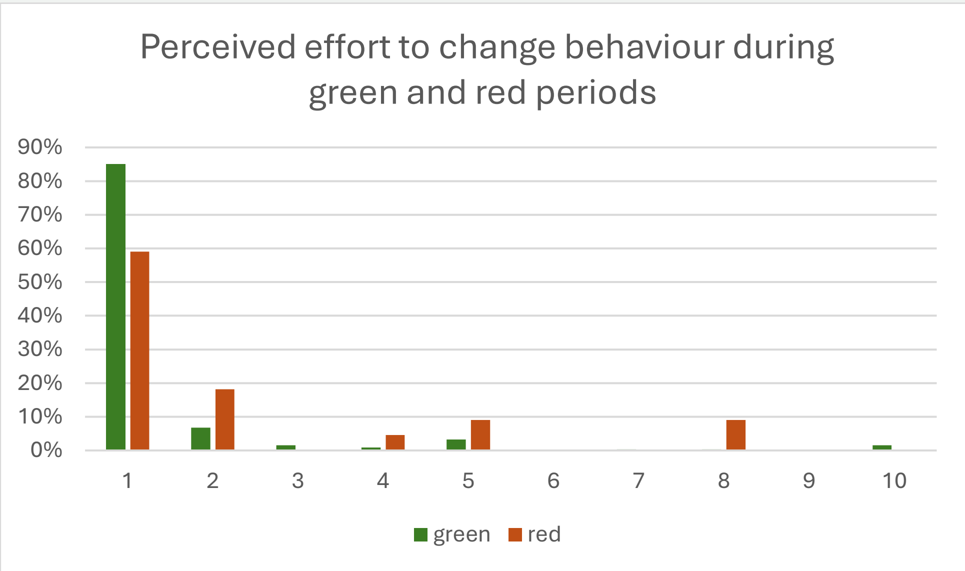


Figure 45: The perceived effort of participants to change their behaviour during 'green' and 'red' time periods. The green time period represents 11.00 AM – 4.00 PM. The red time period represents 6.00 AM – 9.00 AM and 6.00 PM – 10.00 PM.

Overall, only a small proportion of behaviours, approximately 2.7% of the 1,091 recorded entries, occur during peak periods, adhering to the green and/or grey time brackets as defined in the experiment. During the red evening hours, heavier appliances such as dishwashers, washing machines and dryers were predominantly used. Morning red hours occasionally included dishwasher use or making use of smaller appliances such as a tea kettle.

Co-creation workshop Ansen (2025)

Co-creation workshop with Ansen residents

The workshop aimed to enable the active members of EnergieKansen (eKa) to collectively develop a vision and concrete design principles for the strategic direction of their cooperative, building on the NO-GIZMOS pilot results and realistic future scenarios. The outcomes of this co-creation session were simultaneously intended as direct input for the subsequent roadmapping workshop with Enexis, in which the findings would be integrated into a shared agenda for the further collaboration between the energy community and the grid operator.

Workshop design

The workshop took the form of an evening session of approximately 2.5 hours (150 minutes) with a maximum of eighteen participants, divided across three tables of roughly six people each. Participants were active members, board members, and pilot participants of EnergieKansen. Rather than a traditional focus group — which yields opinions but rarely reveals how people actually navigate trade-offs — the session followed a "serious game" format titled "The Future of Ansen". By assigning participants a shared goal and presenting them with concrete choices that had tangible simulated consequences, the format allowed researchers to observe how they reasoned through the dilemmas that lie at the heart of the study.

The game took participants on a journey through three future time steps: 2030, 2035, and a longer horizon (2035+). At each step, they were confronted with a realistic scenario and required to make strategic choices as a cooperative. The central choice was between two paths: Path A ("eKa as an independent cooperative", with limited professionalisation and a focus on its own members) and Path B ("eKa as an Energy Hub", taking on an active role as a regional energy player and formal partner of Enexis). This framing was directly grounded in the technical findings of the pilot, which had demonstrated that the combination of Use Case 4 (balancing community benefit and grid stability) with Use Case 5 as an emergency add-on constitutes the most promising technical foundation.

The workshop was structured around four core dilemmas addressed in sequence over the course of the evening: (1) the *value question* — how to balance individual financial returns, community benefit, and contribution to the energy transition; (2) the *fairness question* — how costs and benefits should be distributed within eKa and between eKa and Enexis; (3) the *governance question* — how the cooperative makes decisions, manages risk, and reconciles professionalisation with its volunteer character; and (4) the *scale question* — whether eKa should focus on Ansen alone or collaborate with neighbouring villages to become a stronger regional actor.

Each table was guided by a Table Facilitator (TF), who led the discussion and introduced the scenario cards, and a Note-taker (NT), who recorded the reasoning and filled in a "Co-op Design Canvas" (A1 poster) and an internal "Phase Log" after each round. The evening opened and closed in plenary, with a short pitch of each table's completed canvas at the end. Key visual tools included a "Scales" template (for the value and scale dilemmas), a "Fairness Matrix" (for the distribution of costs and benefits), and an "Enexis Parking Lot" flipchart on which questions and conditions addressed to the grid operator were collected throughout the evening.

Analysis of the workshop data

All three discussion tables were recorded with both audio and video. After the session, the conversations were transcribed in full and then coded using a deductive coding scheme. The codes were derived directly from the structure of the workshop — in particular the four core dilemmas — and were designed with the explicit intention of feeding into the subsequent roadmapping workshop with Enexis. The analytical framework was therefore oriented specifically towards extracting the social, governance-related, and financial conditions under which the energy community would be willing to take on the "Energy Hub" role (Path B).

The codebook comprises six thematic categories. The first captures the *values* driving strategic choices — for instance the desire for independence from large market actors, or the sense of urgency arising from grid congestion and the energy transition. The second category addresses *governance and risk*, covering attitudes towards professionalisation and the tension between entrepreneurial risk-taking on the one hand and explicit risk aversion on the other. The third category deals with *fairness*, distinguishing between solidarity-based distribution of costs and benefits, meritocratic reward linked to individual asset contributions, and the requirement that any distribution model be simple enough to explain to all members. The fourth category maps attitudes on *scale*, capturing the pull between regional efficiency gains and the fear of losing local identity through cooperation or merger. A fifth category records *technology perception*, including gaps in understanding of energy concepts. A sixth and final category captures *DSO-specific demands* — the conditions and expectations that participants directed at Enexis, most notably the demand for long-term contractual guarantees as a precondition for participation. Table 1 provides an overview of the key codes within each category.

Table 1 Overview of the deductive coding scheme used to analyse the co-creation workshop transcripts.

Category	**Key codes**	**What it captures**
A. Values	`VAL_AUTONOMY` / `VAL_URGENCY` / `VAL_COMMUNITY`	Rationales driving strategic choices: desire for independence, urgency of the transition, social cohesion as a goal in itself.
B. Governance & Risk	`GOV_RISK_ACCEPTANCE` / `GOV_RISK_AVERSION` / `GOV_PROFESSIONAL`	Views on professionalisation, decision-making authority, and appetite for entrepreneurial risk.
C. Fairness	`FAIR_SOLIDARITY` / `FAIR_MERITOCRACY` / `FAIR_TRANSPARENCY`	Principles for distributing costs and benefits: equal sharing vs. asset-based reward; requirement for legible, explainable models.
D. Scale	`SCALE_EFFICIENCY` / `SCALE_IDENTITY_FEAR` / `SCALE_FEDERATION`	Attitudes towards regional cooperation: scale as leverage vs. fear of losing local character; preference for federation over merger.
E. Technology Perception	`TECH_GAP` / `TECH_TRUST`	Understanding of and trust in the technical system; conceptual gaps around energy flows and algorithmic control.
F. DSO-specific demands	`DSO_CONTRACT` / `DSO_PARTNER` / `DSO_OBSTACLE`	Conditions and expectations directed at Enexis: demand for long-term guarantees, view of the DSO as partner or as barrier.

The coding procedure consisted of two steps. First, all transcripts were coded segment by segment against the codebook; any segment that did not clearly belong to one of the six categories was flagged for manual review. Second, the coded material was mapped onto an analytical matrix designed to surface tensions and interactions between categories, since it is precisely these tensions that reveal the conditions the community places on further collaboration. Three cross-cutting tensions proved most analytically productive: whether a strong sense of urgency about the energy transition leads participants towards accepting entrepreneurial risk, or instead prompts demands for Enexis to provide contractual certainty before the community commits; whether the aspiration for a fair benefit-sharing model collides with the limited conceptual grasp of how the energy system works, making any complex distribution formula practically indefensible to members; and what governance arrangement allows the cooperative to gain the benefits of operating at regional scale without triggering the fear of losing local autonomy and identity. In this way, the coding served not merely as a descriptive tool, but as a direct bridge between what was said in the room and the conditions that needed to be placed on the agenda for the Enexis roadmapping workshop.

Results

For the results, please see section 6.4 of the main report.